This document gives pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a major, municipal permit. The discharge results from the operation of a 54.0 MGD wastewater treatment plant. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et seq.

1.	Facility Name and Mailing Address:	Alexandria Advanced WWTP 1500 Eisenhower Avenue Alexandria, VA 22314-3417	SIC Code:	4952 WWTP
	Facility Location:	1500 Eisenhower Avenue Alexandria, VA 22314	City:	Alexandria
	Facility Contact Name:	Maureen O'Shaughnessy	Telephone Number:	703-549-3381
2.	Permit Number:	VA0025160	Current Expiration Date:	19 January 2009
	Other VPDES Permits:	VAR051503 – Stormwater General Permit VAN010059 – General Watershed Permit for Total Nitrogen and Total Phosphorus		
	Other Permits:	Registration Number 70701 – DEQ Air Permit		
	E2/E3/E4 Status:	Exemplary Environmental Enterprise (E3) Member		
3.	Owner Name:	City of Alexandria, Virginia Sanitation Authority		
	Owner Contact/Title:	Maureen O'Shaughnessy Director of Clean Rivers	Telephone Number:	703-549-3381
4.	Application Complete Date:	31 July 2008		
	Permit Drafted By:	Douglas Frasier	Date Drafted:	3 November 2008
	Draft Permit Reviewed By:	Alison Thompson	Date Reviewed:	13 & 17 November 2008
	Public Comment Period:	Start Date: 28 April 2009	End Date:	28 May 2009
5.	Receiving Waters Information:	See **Attachment 1** for the Flow Frequency Determination		
	Receiving Stream Name:	Hunting Creek/ Hooff Run		
	Drainage Area at Outfall:	44.8 square miles	River Mile:	0.57
	Stream Basin:	Potomac River	Subbasin:	Lower Potomac River
	Section:	6	Stream Class:	II
	Special Standards:	b,y	Waterbody ID:	VAN-A13E
	7Q10 Low Flow:	Tidal	7Q10 High Flow:	Tidal
	1Q10 Low Flow:	Tidal	1Q10 High Flow:	Tidal
	Harmonic Mean Flow:	Tidal	30Q5 Flow:	Tidal
	303(d) Listed:	Yes	30Q10 Flow:	Tidal
	TMDL Approved:	Yes	Date TMDL Approved:	31 October 2007

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

✓ State Water Control Law	___ EPA Guidelines
✓ Clean Water Act	✓ Water Quality Standards
✓ VPDES Permit Regulation	✓ Other: Policy for the Potomac Embayments (9 VAC 25-415-10 et seq.)
✓ EPA NPDES Regulation	

7. Licensed Operator Requirements: Class I

8. Reliability Class: Class I

9. Permit Characterization:

____	Private	✓	Effluent Limited	✓	Possible Interstate Effect
____	Federal	✓	Water Quality Limited	____	Compliance Schedule Required
____	State	✓	Toxics Monitoring Program Required	____	Interim Limits in Permit
✓	POTW	✓	Pretreatment Program Required	____	Interim Limits in Other Document
✓	TMDL				

10. Wastewater Sources and Treatment Description:

The Alexandria Advanced Wastewater Treatment Plant is a publicly owned treatment works with a design capacity flow of 54 MGD, serving a population of 297,610 in Fairfax County and the City of Alexandria. A portion of the collection system served, approximately 18%, includes a Combined Sewer System. The Combined Sewer System is owned and operated by the City of Alexandria and is permitted separately from the facility (VA0087068).

Preliminary Treatment

Raw sewage entering the plant passes through two (2) 6 foot wide coarse screens to remove large debris. Screenings are disposed in dumpsters. Flow is then pumped to four (4), belt-type rotating fine screening units for further removal of trash and debris. The screenings are washed, compacted and disposed via landfill. After fine screening, flow enters a grit removal system consisting of four (4) vortex chambers to remove the heavy inorganic materials. The grit is washed, dewatered and disposed via either incineration or landfill.

Primary Treatment

The primary treatment units consist of eight (8) primary settling tanks to remove smaller solid materials. Grease, oils and other floating solids are removed by a skimming mechanism. Solids are removed as sludge and the effluent is pumped to the Biological Reactor Basins (BRBs).

Secondary Treatment

The Biological Nitrogen Removal (BNR) system consists of five (5) Biological Reactor Basins (BRBs) and six (6) secondary settling tanks. Each BRB has a volume of 4 million gallons and is divided into anoxic and aerobic zones. Aerobic zones are aerated by fine bubble air diffusers to facilitate microorganism activity to transform ammonia nitrogen to nitrate. The anoxic zones foster the growth of microorganisms that transform the nitrate to nitrogen gas, which is released into the atmosphere. The system has the flexibility to be operated either in parallel or in a step-feed mode. Methanol addition is available to further enhance the conversion of nitrogen compounds and thus, nitrogen removal.

The mixed liquor flows into the six (6) secondary settling tanks. These process units allow the microorganisms to settle. The settling process is aided by the addition of ferric chloride and/or polymer. The chemical addition at this point also enhances the removal of phosphorus. Solids are either returned to the reactor basins or are wasted to the solids handling system.

Tertiary Treatment

Effluent from the secondary settling tanks is pumped to the tertiary settling process units. This process consists of eight (8) tanks which are divided into a rapid mix tank, flocculation tank and plate settling tank. Flow enters the rapid mix tank where a coagulant (alum or ferric chloride) is added. Flow then passes through the flocculation tank where gentle mixing allows the suspended solids to form a cluster or floc. As the flow passes through the inclined plate settling tank, flocs settle by gravity; thus, removing suspended solids and additional phosphorus.

Flow is then routed to the filtration system. This process contains twenty-two (22) gravity sand filters. Further solids removal is achieved as the plant flow passes through the fine filter media. The filters are equipped with backwashing and air scouring systems that periodically remove the accumulated particles. The backwash is recycled back to an intermediate pump station within the plant.

Final Treatment

Final treatment of the flow is ultraviolet (UV) disinfection. The system consists of six (6) parallel channels with each channel containing two banks of low-pressure low-intensity UV lamps. UV light inactivates the various pathogens found in the water as it passes through the banks. Post-aeration is available to reintroduce air to the final effluent as necessary prior to discharge.

Alternative Final Treatment

Outfall 002 is a shore based concrete structure that serves as an emergency Outfall in the event the UV system should fail. The effluent would be disinfected using chlorination and dechlorination tablet feeders. There is no post aeration at this location. This Outfall would discharge to Hooff Run in the event that it would be utilized.

See **Attachment 2** for a facility schematic/diagram.

TABLE 1 OUTFALL DESCRIPTION				
Outfall Number	**Discharge Sources**	**Treatment**	**Design Flow**	**Outfall Latitude and Longitude**
001	Domestic and Commercial Wastewater	See Item 10 above.	54 MGD	38° 47' 37" N 77° 03' 26" W
002	Domestic and Commercial Wastewater	See Item 10 above.	54 MGD	38° 47' 49" N 77° 03' 36" W
See **Attachment 3** for topographic map.				

11. Sludge Treatment and Disposal Methods:

Gravity Thickening

The gravity thickening system consists of five (5) circular tanks. This process unit receives primary and tertiary sludge. Thickened sludge is pumped to the sludge equalization tanks and the supernatant drains by gravity to the primary effluent pump station.

Mechanical Thickening

The mechanical thickening system consists of four (4) centrifuge trains. Waste activated sludge (WAS) is stored in the raw sludge blending tanks prior to being pumped to each of the centrifuges. Polymer addition aids in the liquid/solids separation process. Solids are then blended with the gravity thickened sludge, which is pumped to the pre-pasteurization facility.

Pre-Pasteurization

This process unit reduces pathogens by heating. The blended thickened sludge passes through two sludge screening presses and is then pumped through heat exchangers. The sludge is heated to a temperature of 158° F. The heated sludge is held in a holding tank at the target temperature for at least 30 minutes. Sludge is then cooled and sent to the digesters.

Digestion

The digestion system consists of four (4) anaerobic digesters. Digestion reduces the pathogenic organisms, reduces the mass of solids and produces methane gas which can be utilized for mixing and for fuel. Sludge is maintained at a temperature of 95° F for mesophilic anaerobic digestion. After digestion, the sludge is pumped to an equalization tank.

Centrifuge Dewatering

The facility has three (3) centrifuge trains used to convert the digested sludge into a dewatered sludge cake. Polymer addition occurs to aid the liquid/solid separation.

Storage and Handling

The biosolids storage and handling system consists of a lime stabilization system and six (6) storage silos. Biosolids are discharged from the centrifuge into the silos until land application or other beneficial reuse.

These process units allow the sludge to be processed to meet Class A pathogen requirements. In the event that digestion is inadequate or the digesters are unavailable for use, the sludge could be lime stabilized to meet Class B pathogen requirements.

The biosolids are currently land applied by a contractor – Synagro. In addition to land application, the facility also has alternative disposal options: soil amendment operation which blends the Class A biosolids with soil and mulch, incineration at the Hopewell Regional WWTF or disposal at the King George Regional Landfill.

Per the application package, this facility generated 5500 dry metric tons last year.

12. Discharges, Intakes, Monitoring Stations and Other Items in Vicinity of Discharge:

TABLE 2 DISCHARGES, INTAKES & MONITORING STATIONS		
ID / Permit Number	Description	Latitude / Longitude
VA0087068	City of Alexandria Combined Sewer System Outfall 003 on Hooff Run	38° 48' 15" / 77° 03' 33"
VA0087068	City of Alexandria Combined Sewer System Outfall 004 on Hooff Run	38° 48' 13" / 77° 03' 34"
1aHUT001.72	DEQ Ambient Monitoring Station Hunting Creek at Route 611/241	38° 47' 55" / 77° 04' 497
VA0025160	Alexandria Advanced Wastewater Treatment Plant Outfall 002 on Hooff Run	38° 47' 49" / 77° 03' 36"
VA0025160	Alexandria Advanced Wastewater Treatment Plant Outfall 001 on Hunting Creek	38° 47' 37" / 77° 03' 26"
VA0087068	City of Alexandria Combined Sewer System Outfall 002 on Hunting Creek	38° 47' 49" / 77° 03' 36"
1aHUT000.01	DEQ Ambient Monitoring Station Hunting Creek at the George Washington Parkway bridge	38° 47' 23" / 77° 03' 06"

13. Material Storage:

TABLE 3 MATERIAL STORAGE			
Material	Location	Volume	Spill / Stormwater Prevention Measures
Aluminum Sulfate	Basement of Building L, Solids Processing Building	Two (2) 6,000 gallon receiving tanks	Receiving tanks are within a spill containment area. Spills would be manually pumped to the plant influent or returned to storage.
Aluminum Sulfate	Basement of Building G2, Advanced Treatment Building	Five (5) 13,600 gallon storage tanks	Storage tanks are within a spill containment area. Spills would be manually pumped to the plant influent.
Ferric Chloride	Basement of Building L, Solids Processing Building	Four (4) 17,453 gallon storage tanks	Storage tanks are within a spill containment area. Spills would be manually pumped to the plant influent.
Ferric Chloride	Basement of Building G2, Advanced Treatment Building	Three (3) 6,000 gallon day tanks	Day tanks are within a spill containment area. Spills would be manually pumped to the plant influent.
Dry Lime	Building L, Solids Processing Building	Two (2) 3,700 cu. ft. storage tanks (260,000 lbs.)	Storage tank area equipped with drains that return to the plant influent.
Methanol	Adjacent to BNR and Secondary Settling	Two (2) 8,000 gallon storage tanks	Storage tanks are within a spill containment unit. Spills would be manually pumped to the plant influent or returned to storage.
Dry Polymer	Building L, Solids Processing Building	30,000 lbs. - maximum	Mix units curbed with drains returning to the plant influent.
Liquid Polymer	Basement of Building L, Solids Processing Building	Three (3) 5,962 gallon storage tanks	Storage tanks are within a spill containment unit. Spills would be manually pumped to the plant influent.

Material	Location	Volume	Spill / Stormwater Prevention Measures
Sodium Hydroxide	Basement of Building L, Solids Processing Building	Two (2) 13,962 gallon storage tanks	Storage tanks are within a spill containment unit. Spills would be manually pumped to the plant influent or returned to storage.
Sodium Hypochlorite	Basement of Building L, Solids Processing Building	Two (2) 13,962 gallon storage tanks	Storage tanks are within a spill containment unit. Spills would be manually pumped to the plant influent or returned to storage.
Sulfuric Acid	Basement of Building L, Solids Processing Building	Two (2) 3,000 gallon storage tanks	Storage tanks are within a spill containment unit. Spills would be manually pumped to the plant influent or returned to storage.

14. Site Inspection: Performed by NRO staff on 13 March 2007. See **Attachment 4** for the Inspection Summary. The entire report is included in the reissuance file. Permitting staff made a subsequent site visit during the pretreatment audit on 7 August 2008.

15. Receiving Stream Water Quality and Water Quality Standards:

a. Ambient Water Quality Data

Hunting Creek – Outfall 001

This receiving stream is listed as impaired for Recreational Use and Fish Consumption Use due to bacterial excursions and Polychlorinated biphenyls (PCB), respectively. A TMDL addressing the PCB impairment has been developed and was approved by EPA on 31 October 2007. This facility was identified in the TMDL as a potential source of PCBs.

Hooff Run – Outfall 002

Hooff Run is also listed as impaired for Fish Consumption Use due to PCBs. The aforementioned TMDL includes this stream and upstream sources.

In addition to the impairments above, significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal. The 2006 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that much of the mainstem Bay does not fully support this use support goal under Virginia's Water Quality Assessment guidelines. Nutrient enrichment is cited as one of the primary causes of impairment.

In response, the Virginia General Assembly amended the State Water Control Law in 2005 to include the *Chesapeake Bay Watershed Nutrient Credit Exchange Program*. This statute set forth total nitrogen and total phosphorus discharge restrictions within the bay watershed. Concurrently, the State Water Control Board adopted new water quality criteria for the Chesapeake Bay and its tidal tributaries. These actions necessitate the evaluation and the inclusion of nitrogen and phosphorus limits on discharges within the bay watershed.

b. Receiving Stream Water Quality Criteria

Part IX of 9 VAC 25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving streams, Hunting Creek and Hooff Run, are located within Section 6 of the Potomac River Basin and classified as Class II water.

Class II tidal waters in the Chesapeake Bay and tidal tributaries must meet dissolved oxygen concentrations as specified in 9 VAC 25-260-185 and maintain a pH of 6.0 – 9.0 standard units as specified in 9 VAC 25-260-50. In the Northern Virginia area, Class II waters must meet the Migratory Fish Spawning and Nursery Designated Use from February 1st through May 31st. For the remainder of the year, these tidal waters must meet the Open Water use. The applicable dissolved oxygen concentrations are presented **Attachment 5**.

Attachment 6 details other water quality criteria applicable to the receiving streams.

Ammonia:

During the last reissuance, staff utilized pH and temperature data from DEQ's ambient monitoring station 1aHUT000.01; however, staff believed that the data contained a sampling bias since collections were conducted during daylight hours, typically between 10 A.M. and 2 P.M. Collections during these times could produce artificially high pH and temperature values. For the last reissuance, staff decided to utilize the 50^{th} percentile pH and temperature values for the calculation of the ammonia criteria. It was thought that by utilizing the 50^{th} percentile, this would dampen the effect of any possible data bias.

The permittee completed a continual in-stream monitoring program during the last permit term to ascertain if the ambient water quality data was indeed skewed. See **Attachment 7** for the in-stream monitoring data and subsequent report for the period of May 2005 through May 2006. A summary of ambient water quality data between January 2004 and March 2008 for station 1aHUT000.01 is available as **Attachment 8**.

Staff evaluated both sets of data and the results indicated no significant difference between the special study results and the DEQ monitoring data at station 1aHUT000.01. Therefore, it is staff's best professional judgement that the ambient water quality data at station 1aHUT000.01 is representative of the receiving stream and the 90^{th} percentile values for pH and temperature may be utilized to calculate the ammonia criteria.

Metals Criteria:

The Water Quality Criteria for some metals are dependent on the hardness (expressed as mg/L calcium carbonate) of the receiving stream or the effluent. Per the application package, ASA conducted four sampling events at Hunting Creek, near the George Washington Parkway bridge, for hardness. Since the data at the monitoring station (1aHUT000.01) was over two (2) years old, it was staff's best professional judgement to utilize the data submitted by the facility. The average hardness of the receiving stream is 175 mg/L as $CaCO_3$.

Effluent data was available as part of the Expanded Effluent Data for Part D of the application. A total of seven (7) data points was included. The monitoring periods were conducted in 2003 and 2008. It was staff's best professional judgement that only the data from 2008 would be utilized since this more accurately represents the present effluent characteristics. The average hardness of the effluent is 122 mg/L as $CaCO_3$.

Bacteria Criteria:

The Virginia Water Quality Standards (9 VAC 25-260-170.B.) states sewage discharges shall be disinfected to achieve the following criteria:

E. coli bacteria per 100 mL of water shall not exceed the following:

	Geometric Mean[1]	Single Sample Maximum
Freshwater *E. coli* (N/100 mL)	126	235

[1]For two or more samples taken during any calendar month

c. Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9 VAC 25-260-360, 370 and 380) designates the river basins, sections, classes and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, Hunting Creek, is located within Section 6 of the Potomac River Basin. This section has been designated with a special standard of 'b' and 'y'.

Special Standard 'b' (Potomac Embayment Standards) established effluent standards for all sewage plants discharging into Potomac River embayments and for expansions of existing plants discharging into non-tidal tributaries of these embayments. 9 VAC 25-415, Policy for the Potomac Embayments, controls point source discharges of conventional pollutants into the Virginia embayment waters of the Potomac River and their tributaries, from the fall line at Chain Bridge in Arlington County to the Route 301 bridge in King George County. The regulation sets effluent limits for $cBOD_5$, Total Suspended Solids, Total Phosphorus and Ammonia to protect the water quality of these high profile waterbodies.

Special Standard 'y' is the chronic Ammonia criterion for tidal freshwater Potomac River and tributaries that enter the tidal freshwater Potomac River from Cockpit Point (below Occoquan Bay) to the fall line at Chain Bridge. During November 1^{st} through February 14^{th} of each year the thirty-day average concentration of Total Ammonia as nitrogen (in mg N/L) shall not exceed, more than once every three years on the average, the following chronic ammonia criterion:

$$\left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} \right) \times 1.45\left(10^{0.028(25-MAX)}\right)$$

MAX = temperature in °C or 7, whichever is greater.

The default design flow for calculating steady state waste load allocations for this chronic Ammonia criterion is the 30Q10, unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of this water quality criterion.

d. Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched for records to determine if there are threatened or endangered species in the vicinity of the discharge. The following threatened or endangered species were identified within a 2 mile radius of the discharge: Brook Floater (mussel); Wood Turtle; Upland Sandpiper (song bird); Loggerhead Shrike (song bird); Henslow's Sparrow (song bird); Appalachian Grizzled Skipper (butterfly); Bald Eagle and Migrant Loggerhead Shrike (song bird). The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and therefore, protect the threatened and endangered species found near the discharge.

The stream that the facility discharges to is within a reach identified as having an Anadromous Fish Use. It is staff's best professional judgment that the proposed limits are protective of this use.

16. Antidegradation (9 VAC 25-260-30):

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream has been classified as Tier 1 based on the fact that the receiving stream has been designated as impaired for Polychlorinated biphenyls (PCBs). Permit limits proposed have been established by determining wasteload allocations which will result in attaining and/or maintaining all water quality criteria which apply to the receiving stream, including narrative criteria. These wasteload allocations will provide for the protection and maintenance of all existing uses.

17. Effluent Screening, Wasteload Allocation and Effluent Limitation Development:

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points are equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLAs) are calculated. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration value is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration value is greater than the chronic wasteload allocation. Effluent limitations are then calculated on the most limiting WLA, the required sampling frequency and statistical characteristics of the effluent data.

a. Effluent Screening

Effluent data obtained from the permit application (Form 2A, Part D.) and Discharge Monitoring Reports (DMRs) has been reviewed and determined to be suitable for evaluation. The DMR data summary can be located in the permit reissuance file.

The following metals were reported above the Method Detection Limit (MDL) on Form 2A, Part D. of the permit application: Cadmium, Chromium, Copper and Zinc.

The reported data warrants a determination if a reasonable potential exists and if effluent limits or monitoring is required. The entire data set was requested and is included with the permit application.

In addition, since this is a wastewater treatment facility, Ammonia and Chlorine (disinfection at Outfall 002) could be present in the discharge and warrants a reasonable potential determination by staff.

b. Mixing Zones and Wasteload Allocations (WLAs)

Hunting Creek, at the point of discharge, is a tidal estuary and has tidal influences. For tidal estuaries, agency guidance states that wasteload allocations should be based on site-specific data of waste dispersion or dilution. Instances that data is not available, default assumptions are recommended. Acute wasteload allocations have been established by multiplying the acute water quality criteria by a factor of two (2). The 2X factor is derived from the fact that the acute criteria are defined as one half of the final acute value (FAV) for a specific toxic pollutant. The term “final acute value” is defined as a cumulative probability of 0.05 for the acute toxicity values for all genera for which acceptable acute tests have been conducted with toxicants (Guidance Memo 00-0211). For chronic toxicity, a 50:1 default dilution factor is recommended per agency guidance.

Alexandria conducted a site specific dilution study and near field-mixing analysis in 1997 for Hunting Creek. Staff partially accepted the results of the study for the evaluation of chronic WLAs during the last reissuance and it is staff’s best professional judgement that these results be carried forward (**Attachment 9**).

The In-stream Waste Concentration (IWC) at segment 6 of the model was accepted as the minimum in-stream dilution that would not cause any downstream water quality violations. These IWCs are as follows:

Season	IWCs
November – March	83%
April – October	91%

It is staff's practice not to tier toxic pollutants such as metals and Chlorine. As such, the chronic WLAs for these pollutants will be determined using the most stringent IWC. The WLAs for the pollutants of concem in this permit are as follows:

Season	Pollutant	Acute WLA	Chronic WLA
November – January	Ammonia	2 x 33 = 66 mg/L	9.2 / 83% = 11 mg/L
February – March	Ammonia	2 x 33 = 66 mg/L	5.7 / 83% = 6.9 mg/L
April – October	Ammonia	2 x 26 = 52 mg/L	5.1 / 91% = 5.6 mg/L
January – December (Year Round)	Cadmium	2 x 4.9 = 9.8 µg/L	1.3 / 91% = 1.4 µg/L
	Chromium	2 x 16 = 32 µg/L	11 / 91% = 12 µg/L
	Copper	2 x 16 = 32 µg/L	11 / 91% = 12 µg/L
	Zinc	2 x 140 = 280 µg/L	140 / 91% = 154 µg/L
	Total Residual Chlorine	2 x 19 = 38 µg/L	11 / 91% = 12 µg/L

Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$\text{WLA} = \frac{C_o\,[\,Q_e + (\,f\,)\,(Q_s\,)\,] - [\,(\,C_s\,)\,(\,f\,)\,(\,Q_s\,)\,]}{Q_e}$$

Where:
WLA = Wasteload allocation
C_o = In-stream water quality criteria
Q_e = Design flow
f = Decimal fraction of critical flow from mixing evaluation
Q_s = Critical receiving stream flow
(1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; 30Q10 for ammonia criteria; and 30Q5 for non-carcinogen human health criteria)
C_s = Mean background concentration of parameter in the receiving stream.

c. Effluent Limitations, Outfall 001 & Outfall 002 – Policy for the Potomac River Embayment

The Policy for the Potomac River Embayment (PPRE), 9 VAC 25-415-10 et seq., established the following effluent limitations; applicable to all sewage treatment plants discharging into the Virginia embayment waters of the Potomac River from the fall line at Chain Bridge in Arlington County to the Route 301 Bridge in King George County:

Parameter	Monthly Average
$cBOD_5$	5 mg/L
Total Suspended Solids	6.0 mg/L
Total Phosphorus	0.18 mg/L
Ammonia (April 1 – October 31)	1.0 mg/L

The PPRE further states that the "above limitations shall not replace or exclude the discharge from meeting the requirements of the State's Water Quality Standards (9 VAC 25-260-10 et seq.)". These limitations are protective of the criteria for dissolved oxygen.

d. Effluent Limitations, Outfall 001 – Toxic Pollutants

9 VAC 25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9 VAC 25-31-230.D. requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) Ammonia as N:

April 1st through October 31st

The Policy for the Potomac River Embayment (PPRE) states that the monthly average limit of 1.0 mg/L will be imposed for the months of April through October. This limit is more stringent than the Water Quality based limits; therefore, the PPRE monthly average limit of 1.0 mg/L will be imposed. The weekly average limit of 4.4 mg/L will be carried forward with this reissuance.

Loading limits are not normally assigned to toxic parameters since the water quality criteria are concentration based, per DEQ Guidance Memorandum 00-2011. However, loading limits for ammonia are included in this permit for the months of April through October. This is based on the nutrient model utilized to establish the PPRE limitations, not the toxic water quality criteria.

November 1st through January 31st

Special Standard 'y' states the period for Early Life Stages Absent as November 1st through February 14th. It is impractical to establish limits for half a calendar month; therefore, it is staff's best professional judgement that limits be proposed for November through January. This conservative approach insures protection against chronic toxicity for any consecutive 30-day period during February and March.

Based on the WLA and subsequent limit derivations, it was determined that limits were not warranted. However, antibacksliding provisions state that a permit may not be renewed, reissued or modified to contain effluent limitations which are less stringent than the comparable effluent limitations in the previous permit (9 VAC 25-31-220.L.). Therefore, it is proposed that the current monthly and weekly average limits be carried forward with this reissuance.

February 1st through March 31st

The limits for February 1st through March 31st are based on water quality criteria for Early Life Stages Present. Based on limit derivations, it is proposed that a monthly average of 6.9 mg/L and a weekly average of 8.5 mg/L be imposed.

See **Attachment 10** for the ammonia limit derivations.

2) Metals:

Analyses of the data indicated that no reasonable potential exists for Cadmium, Chromium, Copper or Zinc; therefore, limits are not warranted (**Attachment 12**).

e. Effluent Limitations and Monitoring, Outfall 002 – Toxic Pollutants

9 VAC 25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9 VAC 25-31-230.D. requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) Ammonia as N:

April 1st through October 31st

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Based on the WLA and subsequent limit derivations, it was determined that limits were not warranted. However, antibacksliding provisions state that a permit may not be renewed, reissued or modified to contain effluent limitations which are less stringent than the comparable effluent limitations in the previous permit (9 VAC 25-31-220.L.). Therefore, it is proposed that the current monthly and weekly average limits be carried forward with this reissuance.

February 1st through March 31st

The limits for February 1st through March 31st are based on water quality criteria for Early Life Stages Present. Based on limit derivations, it is proposed that a monthly average of 6.9 mg/L and a weekly average of 8.5 mg/L be imposed.

See **Attachment 10** for the ammonia limit derivations.

2) Total Residual Chlorine:

Outfall 002 serves as an emergency discharge point for this facility in case the UV disinfection system should fail. The back-up disinfection would consist of chlorination/dechlorination; thus, limitations are necessary since chlorine would potentially be present in the discharge.

Staff calculated WLAs for TRC using current critical flows. In accordance with current DEQ guidance, staff used a default data point of 0.2 mg/L and the calculated WLAs to derive limits. A monthly average of 0.009 mg/L and a weekly average limit of 0.011 mg/L are proposed for this discharge (see **Attachment 11**).

3) Metals:

Analyses of the data indicated that no reasonable potential exists for Cadmium, Chromium, Copper or Zinc; therefore, limits are not warranted (**Attachment 12**).

f. Effluent Limitations and Monitoring, Outfall 001 & Outfall 002 – Conventional and Non-Conventional Pollutants

No changes to Dissolved Oxygen (D.O.), carbonaceous Biochemical Oxygen Demand-5 day ($cBOD_5$), Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TKN) and pH limitations are proposed.

pH limitations are set at the water quality criteria.

E. coli limitations are in accordance with the Water Quality Standards 9 VAC 25-260-170.

g. Effluent Annual Average Limitations and Monitoring, Outfall 001 – Nutrients

VPDES Regulation 9 VAC 25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

As discussed in Section 15, significant portions of the Chesapeake Bay and its tributaries are listed as impaired with nutrient enrichment cited as one of the primary causes. Virginia has committed to protecting and restoring the Bay and its tributaries.

The State Water Control Board adopted new Water Quality Criteria for the Chesapeake Bay in March 2005.
In addition to the Water Quality Standards, there are three new regulations that necessitate nutrient limitations:

- 9 VAC 25-40 – *Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed* requires discharges with design flows of $\geq$ 0.04 MGD to treat for TN and TP to either BNR levels (TN = 8 mg/L; TP = 1.0 mg/L) or SOA levels (TN = 3.0 mg/L and TP = 0.3 mg/L).

- 9 VAC 25-720 – *Water Quality Management Plan Regulation* sets forth TN and TP maximum wasteload allocations for facilities with design flows of $\geq$ 0.5 MGD limiting the mass loading from these discharges.

- 9 VAC 25-820 – *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia* was approved by the State Water Control Board on 6 September 2006 and became effective 1 January 2007. This regulation specifies and controls the nitrogen and phosphorus loadings from facilities and specifies facilities that must register under the general permit. Nutrient loadings for those facilities registered under the general permit as well as compliance schedules and other permit requirements, shall be authorized, monitored, limited and otherwise regulated under the general permit and not this individual permit.

Monitoring for Nitrates + Nitrites, Total Kjeldahl Nitrogen and Total Nitrogen are included in this permit. The monitoring is needed to protect the Water Quality Standards of the Chesapeake Bay. Monitoring frequencies are set at the frequencies set forth in 9 VAC 25-820.

Annual average effluent limitations, as well as monthly and year to date calculations for Total Nitrogen are included in this individual permit.

The facility is currently in the midst of upgrading the existing infrastructure and installing additional process units as part of a two-phased approach to ultimately achieve a Total Nitrogen (TN) annual average concentration of 3 mg/L as set forth in the *Water Quality Management Plan Regulation*, 9 VAC 25-720-50-C.

In the interim, it is proposed that an annual average TN concentration of 6 mg/L be proposed. This is based on the existing plant configuration/operation, recent upgrades and the best engineering assessment concerning the attainable level of treatment during construction. Further upgrades will insure a reliable level of treatment required to meet the WLA of 493,381 lb/year for Total Nitrogen (3 mg/L annual average) at the 54 MGD design flow. These limitations will become effective January 1st following issuance of the CTO upon completion of construction.

The annual average limitation for Total Phosphorus was not included in this individual permit. The monthly average TP limit of 0.18 mg/L is based upon the Policy for the Potomac River Embayment, which the general permit does not supersede. It is staff's best professional judgement that this monthly average limit is more stringent than the annual average at the same concentration per the WLA found in 9 VAC 25-720-120-C.

h. Effluent Annual Average Limitations and Monitoring, Outfall 002 – Nutrients

As stated earlier, Outfall 002 serves as an emergency outfall. The conditions and limitations are set forth in Section 19 and shall be adhered.

VPDES Regulation 9 VAC 25-31-220(D) requires effluent limitations that are protective of both the numerical and narrative water quality standards for state waters, including the Chesapeake Bay.

i. Effluent Limitations and Monitoring Summary

Effluent limitations and monitoring are presented in the following tables. Limits and monitoring were established for pH, $cBOD_5$, Total Suspended Solids, Dissolved Oxygen, Total Kjeldahl Nitrogen, Ammonia, *E. coli*, Nitrate+Nitrite, Total Nitrogen, Total Phosphorus, Total Residual Chlorine (Outfall 002 only) and Chronic Toxicity.

The limit for Total Suspended Solids is based on 9 VAC 25-415-10 et seq.

The mass loading (kg/d) for monthly and weekly averages, were calculated by multiplying the concentration values (mg/L) with the flow values (in MGD) and a conversion factor of 3.785.

The mass loading (lb/d) for Total Phosphorus monthly and weekly averages were calculated by multiplying the concentration values (mg/L) with the flow values (in MGD) and a conversion factor of 8.3438.

The established effluent limitations are expressed as two (2) significant figures. This is consistent with current agency guidance (see Guidance Memo No. 06-2016).

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual and the Monitoring Requirements in 9 VAC 25-820-70.E.1, *General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia*.

18. Antibacksliding:

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

19.a. Effluent Limitations/Monitoring Requirements: Outfall 001

Design flow is 54 MGD.
Effective Dates: During the period beginning with the permit's effective date and lasting until issuance of the CTO for the 54 MGD upgrade or the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS						MONITORING REQUIREMENTS	
		Monthly Average		Weekly Average		Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL		N/A		N/A	NL	Continuous	TIRE
pH	3	N/A		N/A		6.0 S.U.	9.0 S.U.	1/D	Grab
$cBOD_5$	5	5 mg/L	1000 kg/day	8 mg/L	1600 kg/day	N/A	N/A	1/D	24H-C
Total Suspended Solids (TSS)	5	6.0 mg/L	1200 kg/day	9.0 mg/L	1800 kg/day	N/A	N/A	1/D	24H-C
DO	3	N/A		N/A		6.0 mg/L	N/A	1/D	Grab
Total Kjeldahl Nitrogen (TKN)	2,6	NL mg/L		NL mg/L		N/A	N/A	3D/W	24H-C
Ammonia, as N (April – October)	5	1.0 mg/L	200 kg/day	4.4 mg/L	900 kg/day	N/A	N/A	1/D	24H-C
Ammonia, as N (November – January)	3	8.4 mg/L		10 mg/L		N/A	N/A	1/D	24H-C
Ammonia, as N (February – March)	3	6.9 mg/L		8.5 mg/L		N/A	N/A	1/D	24H-C
E. coli (Geometric Mean)	3	126 n/100 mLs		N/A		N/A	N/A	1/D	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L		N/A		N/A	N/A	3D/W	24H-C
Total Nitrogen [(a)]	3,6	NL mg/L		N/A		N/A	N/A	3D/W	Calculated
Total Nitrogen - Year to Date [(b)]	3,6	NL mg/L		N/A		N/A	N/A	1/M	Calculated
Total Nitrogen - Calendar Year [(b)(c)(d)(e)]	2,3,6	6.0 mg/L		N/A		N/A	N/A	1/Y	Calculated
Total Phosphorus	5	0.18 mg/L	81 lb/day	0.27 mg/L	120 lb/day	N/A	N/A	1/D	24H-C
Chronic Toxicity – *C. dubia* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C
Chronic Toxicity – *P. promelas* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Policy for the Potomac River Embayment
6. 9 VAC 25-40 (Nutrient Regulation)

MGD = Million gallons per day.
N/A = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
3D/W = Three days a week.
1/M = Once every month.
1/Y = Once every calendar year.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

(a) Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

(b) See Section 20.a. for the calculation of the Nutrient Calculations.

(c) See Section 21.d.

(d) Should the permittee discharge from Outfall 002, the Total Nitrogen effluent data from Outfall 001 and Outfall 002 shall be averaged together for purposes of calculating compliance.

(e) See Section 21.h.

19.b. Effluent Limitations/Monitoring Requirements: Outfall 002 (Emergency Outfall)

Design flow is 54 MGD.

Effective Dates: During the period beginning with the permit's effective date and lasting until issuance of the CTO for the 54 MGD upgrade or the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS						MONITORING REQUIREMENTS	
		Monthly Average		Weekly Average		Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL		N/A		N/A	NL	Continuous	TIRE
pH	3	N/A		N/A		6.0 S.U.	9.0 S.U.	1/D	Grab
$cBOD_5$	5	5 mg/L	1000 kg/day	8 mg/L	1600 kg/day	N/A	N/A	1/D	24H-C
Total Suspended Solids (TSS)	5	6.0 mg/L	1200 kg/day	9.0 mg/L	1800 kg/day	N/A	N/A	1/D	24H-C
DO	3	N/A		N/A		6.0 mg/L	N/A	1/D	Grab
Total Kjeldahl Nitrogen (TKN)	2	NL		NL		N/A	N/A	3D/W	24H-C
Ammonia, as N (April – October)	5	1.0 mg/L	200 kg/day	4.4 mg/L	900 kg/day	N/A	N/A	1/D	24H-C
Ammonia, as N (November – January)	3	8.4 mg/L		10 mg/L		N/A	N/A	1/D	24H-C
Ammonia, as N (February – March)	3	6.9 mg/L		8.5 mg/L		N/A	N/A	1/D	24H-C
E. coli (Geometric Mean)	3	126 n/100 mLs		N/A		N/A	N/A	1/D	Grab
Total Residual Chlorine (after dechlorination)	3	0.009 mg/L		0.011 mg/L		N/A	N/A	1/D	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L		N/A		N/A	N/A	3D/W	24H-C
Total Nitrogen [(a)]	3,6	NL mg/L		N/A		N/A	N/A	3D/W	Calculated
Total Nitrogen - Year to Date [(b)]	3,6	NL mg/L		N/A		N/A	N/A	1/M	Calculated
Total Nitrogen - Calendar Year [(b)(c)(d)(e)]	2,3,6	6.0 mg/L		N/A		N/A	N/A	1/Y	Calculated
Total Phosphorus	5	0.18 mg/L	81 lb/day	0.27 mg/L	120 lb/day	N/A	N/A	1/D	24H-C
Chronic Toxicity - *C. dubia* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C
Chronic Toxicity - *P. promelas* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Policy for the Potomac River Embayment
6. 9 VAC 25-40 (Nutrient Regulation)

MGD = Million gallons per day.
N/A = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
3D/W = Three days a week.
1/M = Once every month.
1/Y = Once every calendar year.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

(a) Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

(b) See Section 20.a. for the calculation of the Nutrient Calculations.

(c) See Section 21.d.

(d) Should the permittee discharge from Outfall 002, the Total Nitrogen effluent data from Outfall 001 and Outfall 002 shall be averaged together for purposes of calculating compliance.

(e) See Section 21.h.

19.c. Effluent Limitations/Monitoring Requirements: Outfall 001

Design flow is 54 MGD.
Effective Dates: During the period beginning with issuance of the CTO for the 54 MGD upgrade and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	N/A	N/A	NL	Continuous	TIRE
pH	3	N/A	N/A	6.0 S.U.	9.0 S.U.	1/D	Grab
$cBOD_5$	5	5 mg/L 1000 kg/day	8 mg/L 1600 kg/day	N/A	N/A	1/D	24H-C
Total Suspended Solids (TSS)	5	6.0 mg/L 1200 kg/day	9.0 mg/L 1800 kg/day	N/A	N/A	1/D	24H-C
DO	3	N/A	N/A	6.0 mg/L	N/A	1/D	Grab
Total Kjeldahl Nitrogen (TKN)	2,6	NL mg/L	NL mg/L	N/A	N/A	3D/W	24H-C
Ammonia, as N (April – October)	5	1.0 mg/L 200 kg/day	4.4 mg/L 900 kg/day	N/A	N/A	1/D	24H-C
Ammonia, as N (November – January)	3	8.4 mg/L	10 mg/L	N/A	N/A	1/D	24H-C
Ammonia, as N (February – March)	3	6.9 mg/L	8.5 mg/L	N/A	N/A	1/D	24H-C
E. coli (Geometric Mean)	3	126 n/100 mLs	N/A	N/A	N/A	1/D	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L	N/A	N/A	N/A	3D/W	24H-C
Total Nitrogen [(a)]	3,6	NL mg/L	N/A	N/A	N/A	3D/W	Calculated
Total Nitrogen - Year to Date [(b)]	3,6	NL mg/L	N/A	N/A	N/A	1/M	Calculated
Total Nitrogen - Calendar Year [(b)(c)(d)(e)]	3,6	3.0 mg/L	N/A	N/A	N/A	1/Y	Calculated
Total Phosphorus	5	0.18 mg/L 81 lb/day	0.27 mg/L 120 lb/day	N/A	N/A	1/D	24H-C
Chronic Toxicity – *C. dubia* (TU_c)		N/A	N/A	N/A	NL	1/Y	24H-C
Chronic Toxicity – *P. promelas* (TU_c)		N/A	N/A	N/A	NL	1/Y	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Policy for the Potomac River Embayment
6. 9 VAC 25-40 (Nutrient Regulation)

MGD = Million gallons per day.
N/A = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
3D/W = Three days a week.
1/M = Once every month.
1/Y = Once every calendar year.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

(a) Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

(b) See Section 20.a. for the calculation of the Nutrient Calculations.

(c) See Section 21.d.

(d) Should the permittee discharge from Outfall 002, the Total Nitrogen effluent data from Outfall 001 and Outfall 002 shall be averaged together for purposes of calculating compliance.

(e) See Section 21.h.

19.d. Effluent Limitations/Monitoring Requirements: Outfall 002 (Emergency Outfall)

Design flow is 54 MGD.
Effective Dates: During the period beginning with issuance of the CTO for the 54 MGD upgrade and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS						MONITORING REQUIREMENTS	
		Monthly Average		Weekly Average		Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL		N/A		N/A	NL	Continuous	TIRE
pH	3	N/A		N/A		6.0 S.U.	9.0 S.U.	1/D	Grab
$cBOD_5$	5	5 mg/L	1000 kg/day	8 mg/L	1600 kg/day	N/A	N/A	1/D	24H-C
Total Suspended Solids (TSS)	5	6.0 mg/L	1200 kg/day	9.0 mg/L	1800 kg/day	N/A	N/A	1/D	24H-C
DO	3	N/A		N/A		6.0 mg/L	N/A	1/D	Grab
Total Kjeldahl Nitrogen (TKN)	2	NL		NL		N/A	N/A	3D/W	24H-C
Ammonia, as N (April – October)	5	1.0 mg/L	200 kg/day	4.4 mg/L	900 kg/day	N/A	N/A	1/D	24H-C
Ammonia, as N (November – January)	3	8.4 mg/L		10 mg/L		N/A	N/A	1/D	24H-C
Ammonia, as N (February – March)	3	6.9 mg/L		8.5 mg/L		N/A	N/A	1/D	24H-C
E. coli (Geometric Mean)	3	126 n/100 mLs		N/A		N/A	N/A	1/D	Grab
Total Residual Chlorine (after dechlorination)	3	0.009 mg/L		0.011 mg/L		N/A	N/A	1/D	Grab
Nitrate+Nitrite, as N	3,6	NL mg/L		N/A		N/A	N/A	3D/W	24H-C
Total Nitrogen [(a)]	3,6	NL mg/L		N/A		N/A	N/A	3D/W	Calculated
Total Nitrogen - Year to Date [(b)]	3,6	NL mg/L		N/A		N/A	N/A	1/M	Calculated
Total Nitrogen - Calendar Year [(b)(c)(d)(e)]	3,6	3.0 mg/L		N/A		N/A	N/A	1/Y	Calculated
Total Phosphorus	5	0.18 mg/L	81 lb/day	0.27 mg/L	120 lb/day	N/A	N/A	1/D	24H-C
Chronic Toxicity - *C. dubia* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C
Chronic Toxicity - *P. promelas* (TU_c)		N/A		N/A		N/A	NL	1/Y	24H-C

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgement
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Policy for the Potomac River Embayment
6. 9 VAC 25-40 (Nutrient Regulation)

MGD = Million gallons per day.
N/A = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
TIRE = Totalizing, indicating and recording equipment.

1/D = Once every day.
3D/W = Three days a week.
1/M = Once every month.
1/Y = Once every calendar year.

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by 10% or more during the monitored discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

(a) Total Nitrogen = Sum of TKN plus Nitrate+Nitrite.

(b) See Section 20.a. for the calculation of the Nutrient Calculations.

(c) See Section 21.d.

(d) Should the permittee discharge from Outfall 002, the Total Nitrogen effluent data from Outfall 001 and Outfall 002 shall be averaged together for purposes of calculating compliance.

(e) See Section 21.h.

20. Other Permit Requirements:

a. Part I.B. of the permit contains additional chlorine monitoring requirements, quantification levels and compliance reporting instructions.

The Alexandria Sanitation Authority maintains Outfall 002 as a back-up if the UV disinfection system fails. The method of disinfection at Outfall 002 is chlorination. When chlorine is used for disinfection, the final effluent limits in 19.b. and 19.d. for Total Residual Chlorine (TRC) and *E. coli* must be met prior to discharge.

9 VAC 25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9 VAC 25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

The calculations for the Nitrogen parameters shall be in accordance with the calculations set forth in 9 VAC 25-820 *General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia*. §62.1-44.19:13 of the Code of Virginia defines how annual nutrient loads are to be calculated; this is carried forward in 9 VAC 25-820-70. As annual concentrations (as opposed to loads) are limited in the individual permit, these reporting calculations are intended to reconcile the reporting calculations between the permit programs, as the permittee is collecting a single set of samples for the purpose of ascertaining compliance with two permits.

b. Permit Section Part I.C., details the requirements of a Pretreatment Program.

The VPDES Permit Regulation, 9 VAC 25-31-210, requires monitoring and 9 VAC 25-31-220.D. requires all discharges to protect water quality. VPDES Permit Regulations 9 VAC 25-31-730. through 900. and 40 CFR Part 403 requires POTWs with a design flow of > 5 MGD and receiving from Industrial Users (IUs) pollutants which pass through or interfere with the operation of the POTW or are otherwise subject to pretreatment standards to develop a pretreatment program.

c. Permit Section Part I.D., details the requirements for Toxics Management Program.

The VPDES Permit Regulation, 9 VAC 25-31-210, requires monitoring and 9 VAC 25-31-220.I. requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A TMP is imposed for municipal facilities with a design rate > 1.0 MGD, with an approved pretreatment program or required to develop a pretreatment program or those determined by the Board based on effluent variability, compliance history, IWC and receiving stream characteristics (**Attachment 14**).

d. Permit Section Part I.E. details requirements of the Sewage Sludge Management Plan, Sludge Monitoring and Additional Reporting Requirements.

1. Regulations:

VPDES Permit Regulation 9 VAC 25-31-10 et seq. has incorporated technical standards for the use or disposal of sewage sludge, specifically land application and surface disposal, promulgated under 40 CFR Part 503.

Permit Regulation 9 VAC 25-31-420 also establishes the standards for the use or disposal of sewage sludge. This part establishes standards that consist of general requirements, pollutant limits, management practices and operational standards for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in the treatment works.

2. Evaluations:

Sludge Classification:

The Alexandria Advanced WWTP is considered a Class I sludge management facility. Permit regulation, 9 VAC 25-31-500, defines a Class I sludge management facility as any POTW which is required to have an approved pretreatment program defined under Part VII of the VPDES Permit Regulation 9 VAC 25-31-730 to 900 and/or any treatment works treating domestic sewage sludge that has been classified as a Class I facility by the Board because of the potential for its sewage sludge use or disposal practice to adversely affect public health and the environment.

Sludge Pollutant Concentration:

The average pollutant concentrations from sewage sludge analyses provided as part of the Alexandria Advanced WWTP monitoring requirements are presented in Table 4. The monitoring results are from samples collected during the period from January 2006 through May 2008.

TABLE 4 ALEXANDRIA ADVANCED WWTP RESULTS		
Pollutant	Average Concentration (mg/kg dry weight)	Sample Type
Arsenic	5.6	Composite
Cadmium	2.6	Composite
Copper	316	Composite
Lead	47	Composite
Mercury	1.8	Composite
Molybdenum	13	Composite
Nickel	24	Composite
Selenium	5.2	Composite
Zinc	1092	Composite

All sewage sludge applied to the land must meet the ceiling concentration for pollutants, listed in Table 5. Sewage sludge applied to the land must also meet either pollutant concentration limits, cumulative pollutant loading rate limits or annual pollutant loading rate limits, also listed in Table 5.

Cumulative pollutant loading limits or annual pollutant loading limits may be applied to sewage sludge exceeding pollutant concentration limits but meeting the ceiling concentrations, depending upon the levels of treatment achieved and the form (bulk or bag) of sludge applied. It should be noted that ceiling concentration limits are instantaneous values and pollutant concentration limits are monthly average values. Calculations of cumulative pollutant loading should be based on the monthly average values and the annual whole sludge application rate.

TABLE 5 SEWAGE SLUDGE POLLUTANT LIMITS				
Pollutant	Ceiling Concentration Limits for All Sewage Sludge Applied to Land (mg/kg)*	Pollutant Concentration Limits for EQ and PC Sewage Sludge (mg/kg)*	Cumulative Pollutant Loading Rate Limits for CPLR Sewage Sludge (kg/hectare)	Annual Pollutant Rate Limits for APLR Sewage Sludge (kg/hectare/356 day period)**
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	---	---	---
Nickel	420	420	420	21
Selenium	100	100	100	5.0
Zinc	7,500	2,800	2,800	140
Applies to:	All sewage sludge that is land applied	Bulk sewage sludge and bagged sewage sludge	Bulk sewage sludge	Bagged sewage
From VPDES Permit Reg. Part VI	Table 1, 9 VAC 25-31-540	Table 3, 9 VAC 25-31-540	Table 2, 9 VAC 25-31-540	Table 4, 9 VAC 25-31-540

*Dry-weight basis
**Bagged sewage sludge is sold or given away in a bag or other container.

Comparing data from Table 4 with Table 5 shows that metal concentrations are significantly below the ceiling and PC concentration requirements.

3. Options for Meeting Land Application:

There are four equally safe options for meeting land application requirements. The options include the Exceptional Quality (EQ) option, the Pollutant Concentration (PC) option, the Cumulative Pollutant Loading Rate (CPLR) option and the Annual Pollutant Loading Rate (APLR) option.

Exceptional Quality (EQ) is a type of sludge that may be distributed and marketed in either bulk amounts (unpacked) or as a bagged product for application to the land. The sludge from the Alexandria Advanced WWTP is considered Exceptional Quality (EQ) sewage sludge for the following reasons:

a) The sewage sludge meets the Pollutant Concentration Limits in Table 3 of VPDES Permit Regulation Part VI, 9 VAC 25-31-540.

b) The VPDES Permit Regulation, Part VI, Subpart D, (9 VAC 25-31-690 through 720) establishes the requirements for pathogen reduction in sewage sludge. The Alexandria Advanced WWTP is considered to produce a Class A sludge in accordance with regulation 9 VAC 25-31-710.A.7; Alternative 5. Alternative 5 defines Class A sludge as "Sewage sludge that is used or disposed shall be treated in one of the processes to further reduce pathogens described in 9 VAC 25-31-710.E.". The facility utilizes a pasteurization process prior to anaerobic digestion.

c) The VPDES Permit Regulation, Part VI, Subpart D, (9 VAC 25-31-690 through 720) also establishes the requirements for Vector Attraction Reduction in sewage sludge. Based on the information supplied with the VPDES Sludge Application, the Alexandria Advanced WWTP meets the requirements for Vector Attraction Reduction as defined by 9 VAC 25-31-720.B.1: "the mass of volatile solids in the sewage sludge is reduced by a minimum of 38 percent, calculated according to the method in 9 VAC 25-31-490.B.8.".

4. Parameters to be Monitored:

In order to assure the sludge quality, the following parameters require monitoring: Arsenic, Cadmium, Copper, Lead, Mercury, Molybdenum, Nickel, Seleniumand Zinc.

Soil monitoring in conjunction with soil productivity information is critical, especially for frequent applications, to making sound sludge application decisions from both an environmental and an agronomic standpoint. Since the Alexandria Advanced WWTP has contracted the land application responsibilities to Synagro, of Baltimore, Maryland, they are not required to perform soil monitoring.

5. Monitoring Frequency:

The monitoring frequency is based on the amount of sewage sludge applied in a given 365-day period. The permit application indicates the facility generated 5,500 dry metric tons per 365-day period. VPDES Regulation 9 VAC 25-31-570 states the monitoring frequency for facilities that produce equal to or greater than 1,500 but less than 15,000 metric tons per 365-day period is once per sixty (60) days. However, 9 VAC 25-31-750.A.2 allows for a reduction in the monitoring frequency after a monitoring period of two (2) years has been completed. The last permit term required a minimum monitoring frequency of once/year (1/Y). It is proposed that this monitoring frequency be carried forward with this reissuance.

The permittee is required to provide the results of all monitoring performed in accordance with Part I.A.5. and information on management practices and appropriate certifications no later than February 19th of each year (as required by the 503 regulations) to the Department of Environmental Quality, Northern Regional Office. Each report must document the previous calendar year's activities.

6. Sampling:

Representative sampling is an important aspect of monitoring. Because the pollutant limits pertain to the quality of the final sewage sludge applied to the land, samples must be collected after the last treatment process prior to land application. Composite samples should be required for all samplings from this facility.

7. Sludge Management Plan (SMP):

   The SMP is required to be part of the VPDES permit application. The VPDES Sewage Sludge Permit Application Form and its attachments will constitute as the applicant's SMP. Any proposed sewage treatment works treating domestic sewage must submit a SMP with the appropriate VPDES permit application forms at least 180 days prior to the date proposed for commencing operations. The permittee shall conduct all sewage sludge use or disposal activities in accordance with the SMP approved with the issuance of this permit. Any proposed changes in the sewage sludge use or disposal practices or procedures followed by the permittee shall be documented and submitted to the Virginia Department of Environmental Quality, Northern Regional Office for review and approval no less than 90 days prior to the effective date of the changes.

   Upon approval, the SMP becomes an enforceable part of the permit. The permit may be modified or alternatively revoked and reissued to incorporate limitations/conditions necessitated by substantial changes in sewage sludge use or disposal practices.

   The Alexandria Sanitation Authority has submitted the VPDES Sewage Sludge Permit Application Form and its attachments. Their SMP, dated 6 July 2008, is on file at the Department of Environmental Quality, Northern Regional Office.

8. Reporting Requirements:

   The reporting requirements are for POTWs with a design flow rate equal to or greater than 1 MGD (majors), POTWs that serve a population of 10,000 or greater and Class I sludge management facilities. A permit special condition, which requires these generators to submit an annual report on February 19^{th} of each year, is included. The permittee shall use the Discharge Monitoring Report (DMR) forms as part of the annual report. A sample form (SP1 and S01) with proper DMR parameter codes and its instructions are provided. In addition to the DMR forms, the generators who land apply sewage sludge are responsible for submitting the additional information required by 9 VAC 25-31-590 (i.e., appropriate certification statements, descriptions of how pathogen and vector attraction reduction requirements are met, descriptions of how the management practices, as applicable, are being met and descriptions of how site restrictions, as applicable, are being met).

9. Records Keeping:

   This special condition outlines record retention requirements for sludge meeting Class A pathogen reduction and vector attraction reduction alternative 1-10. Table 6 presents the record keeping requirements.

TABLE 6 RECORD KEEPING FOR EQ SLUDGE	
1	Pollutant concentrations of each pollutant in Part I.A.5. of the permit;
2	Description of how the pathogen reduction requirement in Part I.A.5. of the permit are met;
3	Description of how the vector attraction requirements in Part I.A.5. of the permit are met;
4	Description of how the management practice specified in the approved Sludge Management Plan and/or the permit are met;
5	Description of how the site restriction specified in the Sludge Management Plan and/or the permit are met; and
6	Certification statement in Part I.E.3.b.2.f. of the permit.

21. Other Special Conditions:

a) <u>95% Capacity Reopener</u>. The VPDES Permit Regulation at 9 VAC 25-31-200.B.2. requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. This facility is a POTW.

b) <u>Indirect Dischargers</u>. Required by VPDES Permit Regulation, 9 VAC 25-31-280 B.9, for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c) O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190.E. Before or on 1 September 2009, the permittee shall submit for approval an Operations and Maintenance (O&M) Manual or a statement confirming the accuracy and completeness of the current O&M Manual to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO). Future changes to the facility must be addressed by the submittal of a revised O&M Manual within 90 days of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d) CTC, CTO Requirement. The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

9 VAC 25-40-70.A. authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

e) Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq., VPDES Permit Regulation at 9 VAC 25-31-200.D. and Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.) requires licensure of operators. This facility requires a Class I operator.

f) Reliability Class. The Sewage Collection and Treatment Regulations at 9 VAC 25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet Reliability Class I.

g) E3/E4. 9 VAC 25-40-70.B. authorizes DEQ to approve an alternate compliance method to the technology-based effluent concentration limitations as required by subsection A of this section. Such alternate compliance method shall be incorporated into the permit of an Exemplary Environmental Enterprise (E3) facility or an Extraordinary Environmental Enterprise (E4) facility to allow the suspension of applicable technology-based effluent concentration limitations during the period the E3 or E4 facility has a fully implemented environmental management system that includes operation of installed nutrient removal technologies at the treatment efficiency levels for which they were designed.

h) Total Nitrogen – Annual Average Concentration. Current and future Nitrogen Removal Technology (NRT) upgrades will enable this facility to meet the wasteload allocations as set forth in the *Water Quality Management Plan Regulation* at full design flow. Until the NRT upgrades are complete, the Alexandria Service Authority shall maintain and operate the plant to achieve optimal nitrogen removal.

An annual average TN limitation of 3.0 mg/L will take effect January 1st following issuance of the CTO for the plant upgrade at the full 54 MGD design capacity.

i) Final Effluent Monitoring Alternative. 9 VAC 25-31-30 Federal Effluent Guidelines incorporates by reference Secondary Treatment 40 CFR Part 133 (1999). 40 CFR Part 133.104 permits the substitution of chemical oxygen demand (COD) or total organic carbon (TOC) for BOD_5 when a long-term BOD_5 : COD or BOD_5 : TOC correlation has been demonstrated. This special condition allows the permittee to develop a facility specific correlation between $cBOD_5$ and COD for final effluent compliance monitoring.

The permittee may submit to DEQ for review and approval a plan of study prior to the start of the study. The plan shall include: method of analysis for COD; QA/QC procedures for the method; time frame for study; number of samples to be analyzed to establish the correlation; the statistical methods for determining the correlation; and the method of validating the established correlation.

Once the study is completed and a correlation is established, the data, QA/QC information and correlation calculations are to be submitted to DEQ for review and approval. Upon DEQ's approval of the results, the correlation shall be utilized to calculate monthly average and weekly average COD effluent limits. Monitoring for COD will be once per day and sampling will be 24-hour composites. The COD limits shall be included on the DMR and monitoring for $cBOD_5$ shall be reduced to once per week for the remaining term of the permit. COD results shall be reported in accordance with Part II.C.

Validation of the correlation: the facility shall be required to validate the established correlation, as outlined in the plan of study and report the validation with the monthly DMR. A summary of the validation data shall also be submitted with the permit application. If the facility fails to submit the summary validation data, the permittee will have to complete a new study for review and approval by DEQ and also return to $cBOD_5$ final effluent monitoring at the frequency required by the permit prior to beginning COD monitoring.

This special condition also allows the facility to opt out of COD final effluent monitoring and revert back to regular $cBOD_5$ monitoring at any time upon notification to DEQ in writing. The $cBOD_5$ final effluent monitoring will then become effective the first day of the next full month following the written request.

j) Nutrient Reopener. 9 VAC 25-40-70.A. authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade. 9 VAC 25-31-390.A. authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

k) PCB Monitoring. This special condition shall require the permittee to monitor and report PCB concentrations in dry weather and wet weather effluent samples. The results from this monitoring shall be used to implement the PCB TMDL that was developed for the Potomac and Anacostia Rivers and approved by EPA on 31 October 2007.

l) Application for Reclamation and Reuse and Reclaimed Water Management Plan. In accordance with 9 VAC 25-740-100 of the Water Reclamation and Reuse Regulation, the permittee shall submit to DEQ-NRO, for approval, a detailed application at least 90 days prior to commencing reuse.

m) TMDL Reopener. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL that may be developed and approved for the receiving stream.

22. Permit Section Part II: Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. Changes to the Permit from the Previously Issued Permit:

a) Special Conditions:

- The Water Quality Criteria Reopener was removed with this reissuance.
- The In Stream Monitoring special condition was removed since the requirement was fulfilled during the last permit term.
- The following special conditions were included with this reissuance:
  - E3/E4;
  - Nutrient Reopener;
  - CTC, CTO Requirement;
  - Total Nitrogen – Annual Average Concentration;
  - PCB Monitoring; and
  - Application for Reclamation and Reuse and Reclaimed Water Management Plan.

b) Monitoring and Effluent Limitations:

- Ammonia limitations for February through March were reduced to 6.9 mg/L and 8.5 mg/L for the monthly and weekly averages, respectively.
- The Orthophosphorus monitoring was removed based on current agency guidance.
- Monitoring frequencies for TKN, Nitrate+Nitrite and Total Nitrogen were increased from once per week (1/W) to three days per week (3D/W) based on monitoring requirements found in 9 VAC 25-820-70.E.1.

24. Variances/Alternate Limits or Conditions: Not Applicable.

25. Public Notice Information:

First Public Notice Date: 27 April 2009 Second Public Notice Date: 4 May 2009

Public Notice Information is required by 9 VAC 25-31-280.B. All pertinent information is on file and may be inspected and copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3873, ddfrasier@deq.virginia.gov. See **Attachment 15** for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

26. 303 (d) Listed Stream Segments and Total Max. Daily Loads (TMDL):

This receiving stream is listed as impaired due to bacterial excursions and Polychlorinated biphenyls (PCBs). A TMDL addressing the PCB impairment has been developed and was approved by the U.S. EPA on 31 October 2007. This facility was identified in the TMDL as a potential source of PCBs. A monitoring special condition was included with this reissuance.

In addition, the 2006 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that nutrient enrichment is also cited as a cause of impairment.

The proposed limitations and monitoring should not contribute to the further impairment of the receiving stream.

27. Additional Comments:

Previous Board Action(s):	None.
Staff Comments:	None received.
Public Comment:	No comments were received during the public notice.
EPA Checklist:	The checklist can be found in **Attachment 16**.

Fact Sheet Attachments – Table of Contents

Alexandria Advanced Wastewater Treatment Plant
VA0025160
2009 Reissuance

The flows provided below represent the freshwater inflow to the Hunting Creek.

Hunting Creek at discharge point:

Drainage Area = 44 mi^2

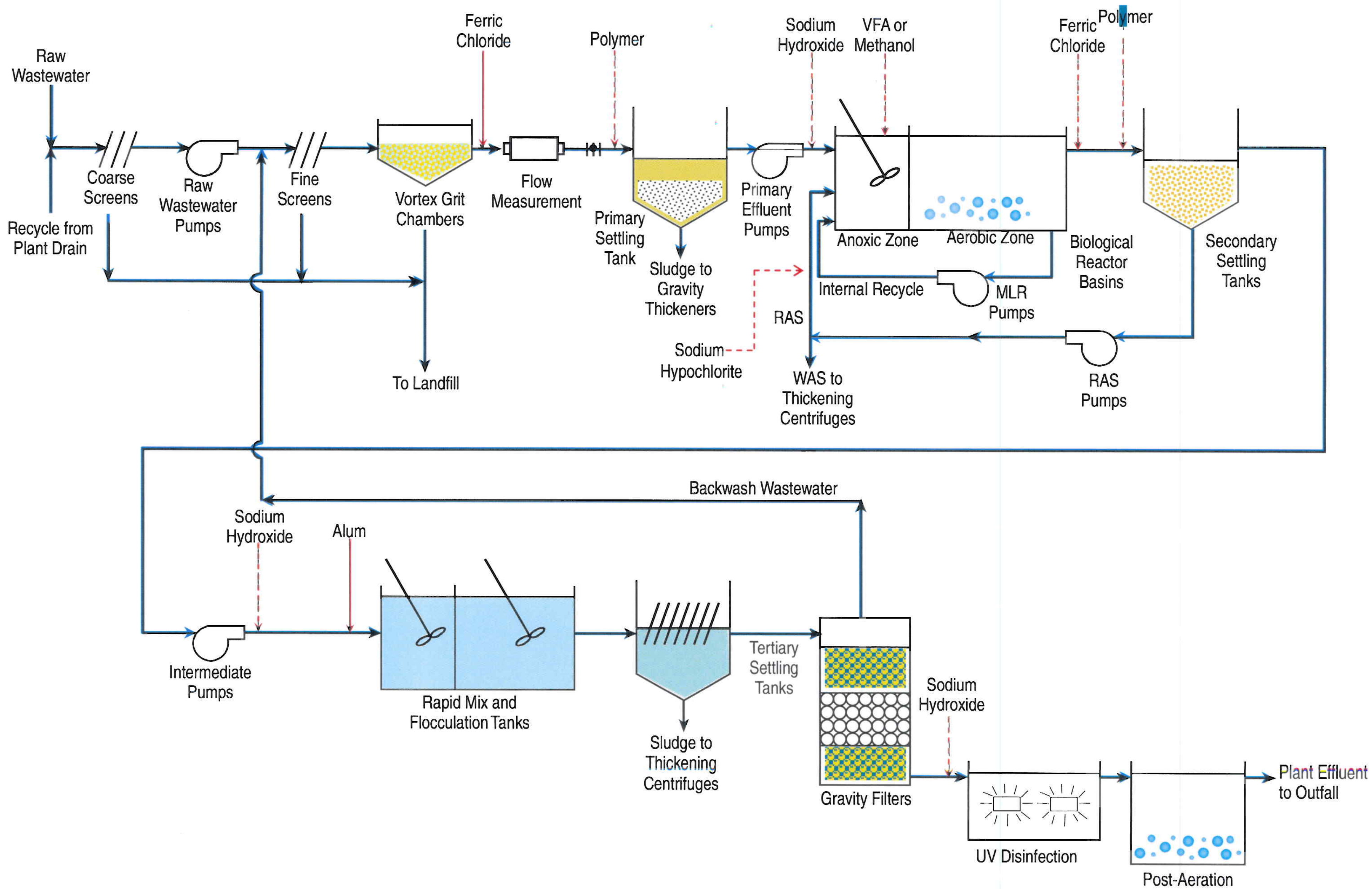
1Q10 = 1.8 cfs	1.16 MGD	HQ PES 1Q10 =	4.0 cfs = 2.58 MGD
7Q10 = 2.5 cfs	1.62"	HQ PES 7Q10 =	5.2 cfs = 3.36 "
30Q5 = 5.0 cfs	3.23"	HM =	14 cfs = 9.05 "

Be advised, the seasonal tiering defined in the Policy for Potomac Embayments is not based on stream flow. Rather, the tiers are temperature based. Procedures for establishing flows during the months included in a temperture tier are not addressed in Section III-A pages 12-17 of the "Virginia Water Control Board VPDES Technical Reference Manual".

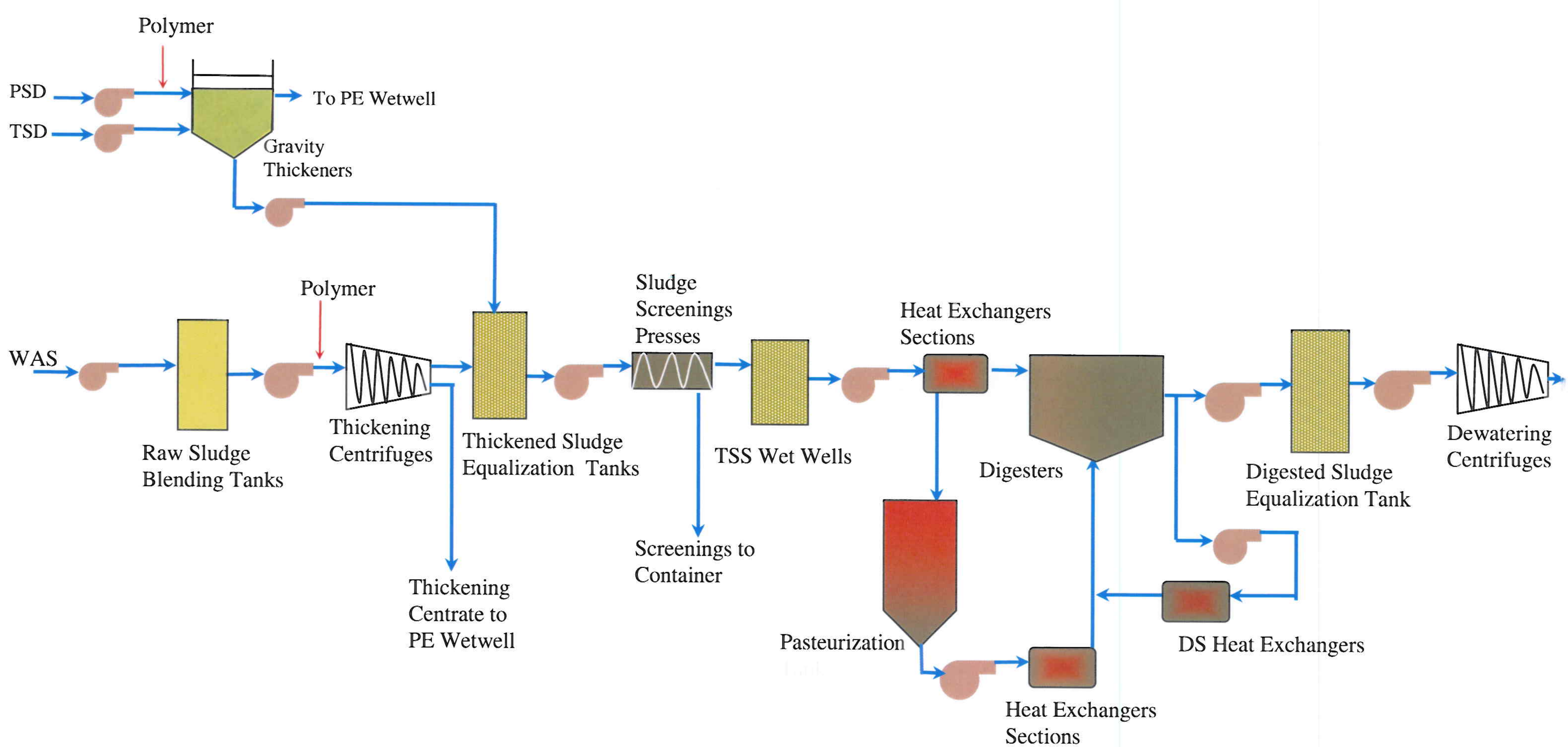
If you have any questions concerning this analysis, please let me know.

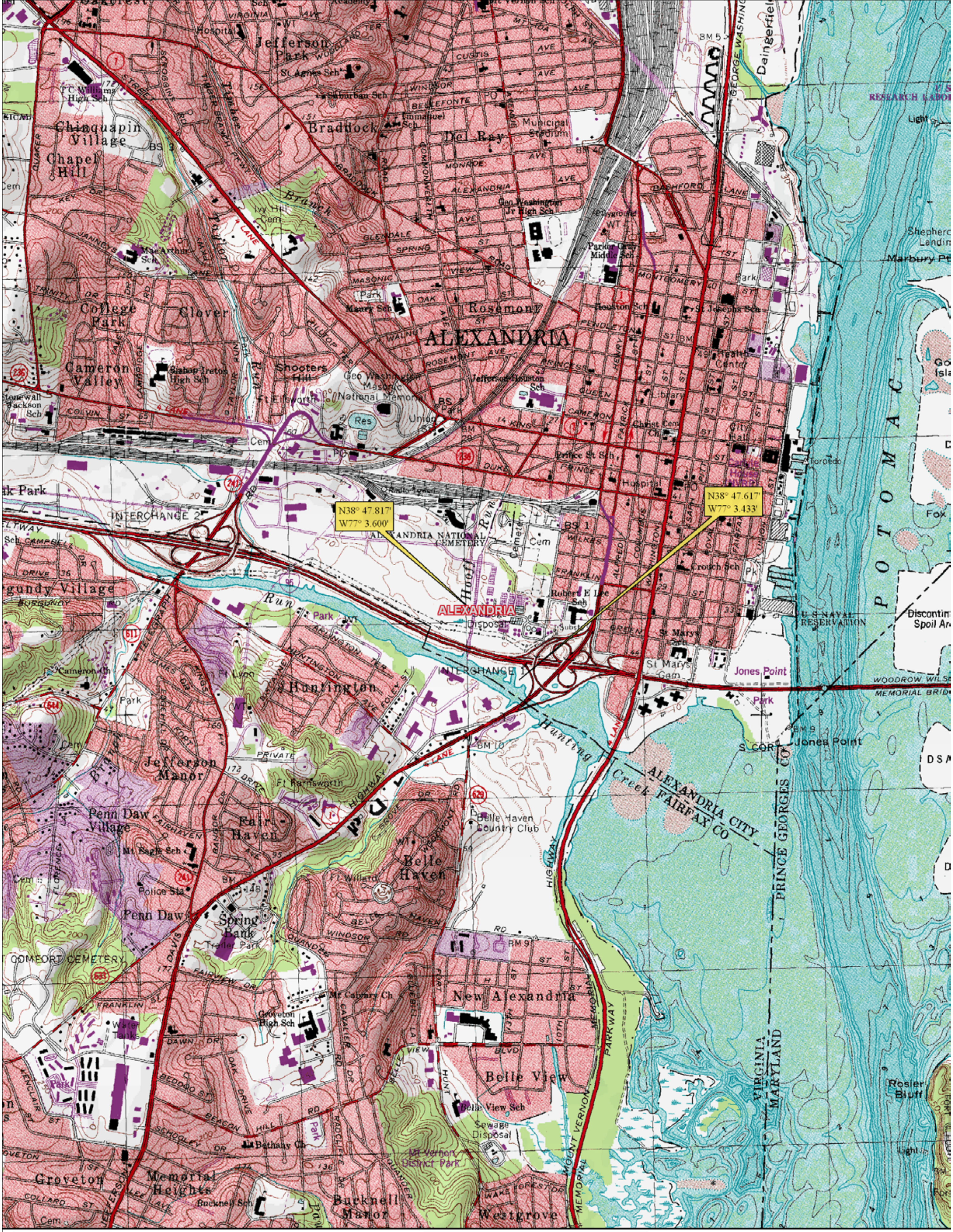
HQ PES = NOV - MAR

Liquids Process Schematic



Solids Process Schematic




N38° 47.817'
W77° 3.600'
N38° 47.617'
W77° 3.433'
ALEXANDRIA
Jefferson Park
Braddock
Del Ray
Chinquapin Village
Chapel Hill
College Park
Clover
Cameron Valley
Rosemont
Shooters Hill
Geo Washington Masonic National Memorial
ALEXANDRIA NATIONAL CEMETERY
INTERCHANGE 2
INTERCHANGE 1
Huntington
Jefferson Manor
Penn Daw Village
Penn Daw
Fair Haven
Belle Haven
Belle Haven Country Club
Spring Bank
New Alexandria
Belle View
Groveton
Memorial Heights
Bucknell Manor
Westgrove
COMFORT CEMETERY
Jones Point
POTOMAC
ALEXANDRIA CITY
FAIRFAX CO
PRINCE GEORGES CO
VIRGINIA
MARYLAND
Hunting Creek
U S NAVAL RESERVATION
WOODROW WILSON MEMORIAL BRIDGE
MOUNT VERNON MEMORIAL PARKWAY
Dangerfield
Marbury Pt
Rosier Bluff
Mt Vernon District Park

Technical Summary

Recommendations at last inspection:

- **The back-up generators at the pump stations are run once weekly, but are not tested under load. Generators should be tested under load to assure that they will work adequately when needed.** Generators are tested under load**.**

- **The broken spray line in the secondary clarifiers should be fixed.** This problem was fixed before the inspection report was sent.

Comments from the Current Inspection

- **Plant staff is again commended for the efforts made to kept the buildings and grounds clean and odor free.**

- **The flights in all the primary clarifiers are scheduled to be replaced by a contractor within the next few months. Flights in the secondary clarifiers were all replaced within the last year.**

- **The sludge pre-pasturization system and all digesters are fully operating.**

- **The backflow control devices were checked in April 2007, 3 months overdue.**

Dissolved Oxygen Criteria (9 VAC 25-260-185)

Designated Use	**Criteria Concentration/Duration**	**Temporal Application**
Migratory fish spawning and nursery	7-day mean > 6 mg/L (tidal habitats with 0-0.5 ppt salinity)	February 1 – May 31
	Instantaneous minimum > 5 mg/L	
Open-water[1,2]	30-day mean > 5.5 mg/L (tidal habitats with 0-0.5 ppt salinity) 30-day mean > 5 mg/L (tidal habitats with >0.5 ppt salinity)	Year-round
	7-day mean > 4 mg/L	
	Instantaneous minimum > 3.2 mg/L at temperatures < 29°C Instantaneous minimum > 4.3 mg/L at temperatures > 29°C	
Deep-water	30-day mean >3 mg/L	June 1-September 30
	1-day mean > 2.3 mg/L	
	Instantaneous minimum > 1.7 mg/L	
Deep-channel	Instantaneous minimum > 1 mg/L	June 1-September 30

[1]See subsection aa of 9 VAC 25-260-310 for site specific seasonal open-water dissolved oxygen criteria applicable to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries.

[2]In applying this open-water instantaneous criterion to the Chesapeake Bay and its tidal tributaries where the existing water quality for dissolved oxygen exceeds an instantaneous minimum of 3.2 mg/L, that higher water quality for dissolved oxygen shall be provided antidegradation protection in accordance with section 30 subsection A.2 of the Water Quality Standards.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: City of Alexandria Sanitation   Permit No.: VA0025160

Receiving Stream: Hunting Creek   Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	175	mg/L
90% Temperature (Annual) =		deg C
90% Temperature (Wet season) =	27.6	deg C
90% Maximum pH =	7.6	SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD
Annual Average =	0	MGD

Mixing Information

Annual - 1Q10 Mix =	0	%
- 7Q10 Mix =	0	%
- 30Q10 Mix =	0	%
Wet Season - 1Q10 Mix =	0	%
- 30Q10 Mix =	0	%

Effluent Information

Mean Hardness (as CaCO3) =	122	mg/L
90% Temp (Annual) =		deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.3	SU
10% Maximum pH =		SU
Discharge Flow =	54	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+03**
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.8E+02**
Acrylonitrile[C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.6E+00**
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.0E+00	--	na	1.4E-03	--	--	--	--	--	--	--	--	**3.0E+00**	**--**	**na**	**1.4E-03**
Ammonia-N (mg/l) (Yearly)	0	2.62E+01	5.08E+00	na	--	2.6E+01	5.1E+00	na	--	--	--	--	--	--	--	--	--	**2.6E+01**	**5.1E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	2.62E+01	5.08E+00	na	--	2.6E+01	5.1E+00	na	--	--	--	--	--	--	--	--	--	**2.6E+01**	**5.1E+00**	**na**	**--**
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+05**
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.3E+03**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	**3.4E+02**	**1.5E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.1E+02**
Benzidine[C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E-03**
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+05**
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+03**
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.2E+03**
Cadmium	0	4.9E+00	1.3E+00	na	--	4.9E+00	1.3E+00	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**1.3E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.4E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	--	--	--	--	--	--	--	--	**2.4E+00**	**4.3E-03**	**na**	**2.2E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	**8.6E+05**	**2.3E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.9E+01**	**1.1E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.4E+02**
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+04**
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.3E+03**
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	**8.3E-02**	**4.1E-02**	**na**	**--**
Chromium III	0	6.7E+02	8.7E+01	na	--	6.7E+02	8.7E+01	na	--	--	--	--	--	--	--	--	--	**6.7E+02**	**8.7E+01**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.6E+01**	**1.1E+01**	**na**	**--**
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Copper	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.6E+01**	**1.1E+01**	**na**	**--**
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	--	--	--	--	--	--	--	--	**2.2E+01**	**5.2E+00**	**na**	**2.2E+05**
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.4E-03**
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.9E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	--	--	--	--	--	--	--	--	**1.1E+00**	**1.0E-03**	**na**	**5.9E-03**
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+04**
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+04**
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+03**
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+03**
3,3-Dichlorobenzidine[C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E-01**
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E+02**
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.9E+02**
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+05**
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.9E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.9E+02**
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+03**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	--	--	--	--	--	--	--	--	**2.4E-01**	**5.6E-02**	**na**	**1.4E-03**
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+05**
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.9E+01**
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.3E+03**
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+06**
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+04**
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+04**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.1E+01**
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**na**
1,2-Diphenylhydrazine[C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	**na**	**2.4E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	**na**	**2.4E+02**
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+02**
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	--	--	--	--	--	--	--	--	**8.6E-02**	**3.6E-02**	**na**	**8.1E-01**
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+04**
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.7E+02**
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+04**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**2.1E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**1.1E-03**
Hexachlorobenzene[C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E-03**
Hexachlorobutadiene[C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.0E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	--	na	6.3E-01	--	--	--	--	--	--	--	--	**9.5E-01**	**--**	**na**	**6.3E-01**
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
Hexachloroethane[C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**2.0E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	1.5E+02	1.7E+01	na	--	1.5E+02	1.7E+01	na	--	--	--	--	--	--	--	--	--	**1.5E+02**	**1.7E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	--	--	--	--	--	--	--	--	**1.4E+00**	**7.7E-01**	**na**	**5.1E-02**
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+03**
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E-02**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**
Nickel	0	2.2E+02	2.4E+01	na	4.6E+03	2.2E+02	2.4E+01	na	4.6E+03	--	--	--	--	--	--	--	--	**2.2E+02**	**2.4E+01**	**na**	**4.6E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+03**
N-Nitrosodimethylamine[C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	**6.5E-02**	**1.3E-02**	**na**	**--**
PCB-1016	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1221	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1232	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1242	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1248	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1254	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1260	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB Total[C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E-03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	7.7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	**7.7E-03**	**5.9E-03**	**na**	**8.2E+01**
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E+06**
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+00**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+00**
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+04**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.0E+01	5.0E+00	na	1.1E+04	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**na**	**1.1E+04**
Silver	0	4.9E+00	--	na	--	4.9E+00	--	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+02**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.3E+00**
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.3E-01	2.0E-04	na	7.5E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**na**	**7.5E-03**
Tributyltin	0	4.6E-01	6.3E-02	na	--	4.6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	**4.6E-01**	**6.3E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.4E+02**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+02**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+01**
Zinc	0	1.4E+02	1.4E+02	na	6.9E+04	1.4E+02	1.4E+02	na	6.9E+04	--	--	--	--	--	--	--	--	**1.4E+02**	**1.4E+02**	**na**	**6.9E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens,
   Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+03
Arsenic	9.0E+01
Barium	na
Cadmium	8.0E-01
Chromium III	5.2E+01
Chromium VI	6.4E+00
Copper	6.4E+00
Iron	na
Lead	1.0E+01
Manganese	na
Mercury	5.1E-02
Nickel	1.4E+01
Selenium	3.0E+00
Silver	1.9E+00
Zinc	5.5E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: City of Alexandria Sanitation

Permit No.: VA0025160

Receiving Stream: Hunting Creek

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	175	mg/L
90% Temperature (Annual) =		deg C
90% Temperature (Wet season) =	17.6	deg C
90% Maximum pH =	7.5	SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	n	

Stream Flows

1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD
Annual Average =	0	MGD

Mixing Information

Annual - 1Q10 Mix =	0	%
- 7Q10 Mix =	0	%
- 30Q10 Mix =	0	%
Wet Season - 1Q10 Mix =	0	%
- 30Q10 Mix =	0	%

Effluent Information

Mean Hardness (as CaCO3) =	122	mg/L
90% Temp (Annual) =		deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.1	SU
10% Maximum pH =		SU
Discharge Flow =	54	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+03**
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.8E+02**
Acrylonitrile[C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.6E+00**
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.0E+00	--	na	1.4E-03	--	--	--	--	--	--	--	--	**3.0E+00**	**--**	**na**	**1.4E-03**
Ammonia-N (mg/l) (Yearly)	0	3.29E+01	9.20E+00	na	--	3.3E+01	9.2E+00	na	--	--	--	--	--	--	--	--	--	**3.3E+01**	**9.2E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	3.29E+01	9.20E+00	na	--	3.3E+01	9.2E+00	na	--	--	--	--	--	--	--	--	--	**3.3E+01**	**9.2E+00**	**na**	**--**
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+05**
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.3E+03**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	**3.4E+02**	**1.5E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.1E+02**
Benzidine[C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E-03**
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+05**
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+03**
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.2E+03**
Cadmium	0	4.9E+00	1.3E+00	na	--	4.9E+00	1.3E+00	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**1.3E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.4E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	--	--	--	--	--	--	--	--	**2.4E+00**	**4.3E-03**	**na**	**2.2E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	**8.6E+05**	**2.3E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.9E+01**	**1.1E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	--	--	na	3.4E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	--	--	--	--	--	--	--	--	na	4.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	na	--
Chromium III	0	6.7E+02	8.7E+01	na	--	6.7E+02	8.7E+01	na	--	--	--	--	--	--	--	--	--	6.7E+02	8.7E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Copper	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	na	2.2E+05
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	--	--	--	--	--	--	--	--	na	8.4E-03
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	--	--	--	--	--	--	--	--	na	5.9E-03
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	--	--	--	--	--	--	--	--	1.1E+00	1.0E-03	na	5.9E-03
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	--	--	--	--	--	--	--	--	na	1.6E+04
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
3,3-Dichlorobenzidine[C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	--	--	--	--	--	--	--	--	na	7.7E-01
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	--	--	--	--	--	--	--	--	na	4.6E+02
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	--	--	na	9.9E+02
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	--	--	na	1.4E+05
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	--	--	--	--	--	--	--	--	na	7.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	--	--	--	--	--	--	--	--	na	3.9E+02
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	na	1.4E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	--	--	na	1.2E+05
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	--	--	--	--	--	--	--	--	na	5.9E+01
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	--	--	na	2.3E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	--	--	--	--	--	--	--	--	na	2.9E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	--	--	--	--	--	--	--	--	na	7.7E+02
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	--	--	na	9.1E+01
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	--	--	na	na
1,2-Diphenylhydrazine[C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	--	--	na	5.4E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	--	--	na	2.4E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	na	8.1E-01
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	--	--	--	--	--	--	--	--	na	8.1E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	--	--	na	3.7E+02
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	--	1.0E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	2.1E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	1.1E-03
Hexachlorobenzene [C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	--	--	--	--	--	--	--	--	na	7.7E-03
Hexachlorobutadiene [C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	--	--	--	--	--	--	--	--	na	5.0E+02
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	--	--	--	--	--	--	--	--	na	1.3E-01
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	--	--	--	--	--	--	--	--	na	4.6E-01
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	--	na	6.3E-01	--	--	--	--	--	--	--	--	9.5E-01	--	na	6.3E-01
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
Hexachloroethane [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	--	2.0E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone [C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	--	--	na	2.6E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	1.5E+02	1.7E+01	na	--	1.5E+02	1.7E+01	na	--	--	--	--	--	--	--	--	--	1.5E+02	1.7E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	--	--	--	--	--	--	--	--	1.4E+00	7.7E-01	na	5.1E-02
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	--	--	na	4.0E+03
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	--	3.0E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	--	--	na	2.1E+04
Nickel	0	2.2E+02	2.4E+01	na	4.6E+03	2.2E+02	2.4E+01	na	4.6E+03	--	--	--	--	--	--	--	--	2.2E+02	2.4E+01	na	4.6E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	na	1.9E+03
N-Nitrosodimethylamine [C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	--	--	--	--	--	--	--	--	na	8.1E+01
N-Nitrosodiphenylamine [C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	--	--	na	1.6E+02
N-Nitrosodi-n-propylamine [C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	--	--	na	1.4E+01
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	6.5E-02	1.3E-02	na	--
PCB-1016	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1221	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1232	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1242	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1248	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1254	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1260	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB Total [C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	--	--	--	--	--	--	--	--	na	1.7E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	7.7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	**7.7E-03**	**5.9E-03**	**na**	**8.2E+01**
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E+06**
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+00**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+00**
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+04**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.0E+01	5.0E+00	na	1.1E+04	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**na**	**1.1E+04**
Silver	0	4.9E+00	--	na	--	4.9E+00	--	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+02**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.3E+00**
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.3E-01	2.0E-04	na	7.5E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**na**	**7.5E-03**
Tributyltin	0	4.6E-01	6.3E-02	na	--	4.6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	**4.6E-01**	**6.3E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.4E+02**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+02**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+01**
Zinc	0	1.4E+02	1.4E+02	na	6.9E+04	1.4E+02	1.4E+02	na	6.9E+04	--	--	--	--	--	--	--	--	**1.4E+02**	**1.4E+02**	**na**	**6.9E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens,
   Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+03
Arsenic	9.0E+01
Barium	na
Cadmium	8.0E-01
Chromium III	5.2E+01
Chromium VI	6.4E+00
Copper	6.4E+00
Iron	na
Lead	1.0E+01
Manganese	na
Mercury	5.1E-02
Nickel	1.4E+01
Selenium	3.0E+00
Silver	1.9E+00
Zinc	5.5E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: City of Alexandria Sanitation   Permit No.: VA0025160

Receiving Stream: Hunting Creek   Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	175	mg/L
90% Temperature (Annual) =		deg C
90% Temperature (Wet season) =	16.2	deg C
90% Maximum pH =	7.4	SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD
Annual Average =	0	MGD

Mixing Information		
Annual - 1Q10 Mix =	0	%
- 7Q10 Mix =	0	%
- 30Q10 Mix =	0	%
Wet Season - 1Q10 Mix =	0	%
- 30Q10 Mix =	0	%

Effluent Information		
Mean Hardness (as CaCO3) =	122	mg/L
90% Temp (Annual) =		deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	7.1	SU
10% Maximum pH =		SU
Discharge Flow =	54	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+03**
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.8E+02**
Acrylonitrile[C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.6E+00**
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.0E+00	--	na	1.4E-03	--	--	--	--	--	--	--	--	**3.0E+00**	**--**	**na**	**1.4E-03**
Ammonia-N (mg/l) (Yearly)	0	3.29E+01	5.67E+00	na	--	3.3E+01	5.7E+00	na	--	--	--	--	--	--	--	--	--	**3.3E+01**	**5.7E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	3.29E+01	5.67E+00	na	--	3.3E+01	5.7E+00	na	--	--	--	--	--	--	--	--	--	**3.3E+01**	**5.7E+00**	**na**	**--**
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+05**
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.3E+03**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	**3.4E+02**	**1.5E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.1E+02**
Benzidine[C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.4E-03**
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+05**
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.6E+03**
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.2E+03**
Cadmium	0	4.9E+00	1.3E+00	na	--	4.9E+00	1.3E+00	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**1.3E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.4E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	--	--	--	--	--	--	--	--	**2.4E+00**	**4.3E-03**	**na**	**2.2E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	**8.6E+05**	**2.3E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.9E+01**	**1.1E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	--	--	na	3.4E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	--	--	--	--	--	--	--	--	na	4.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	na	--
Chromium III	0	6.7E+02	8.7E+01	na	--	6.7E+02	8.7E+01	na	--	--	--	--	--	--	--	--	--	6.7E+02	8.7E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Copper	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	na	2.2E+05
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	--	--	--	--	--	--	--	--	na	8.4E-03
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	--	--	--	--	--	--	--	--	na	5.9E-03
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	--	--	--	--	--	--	--	--	1.1E+00	1.0E-03	na	5.9E-03
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	--	--	--	--	--	--	--	--	na	1.6E+04
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
3,3-Dichlorobenzidine[C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	--	--	--	--	--	--	--	--	na	7.7E-01
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	--	--	--	--	--	--	--	--	na	4.6E+02
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	--	--	na	9.9E+02
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	--	--	na	1.4E+05
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	--	--	--	--	--	--	--	--	na	7.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	--	--	--	--	--	--	--	--	na	3.9E+02
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	na	1.4E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	--	--	na	1.2E+05
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	--	--	--	--	--	--	--	--	na	5.9E+01
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	--	--	na	2.3E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	--	--	--	--	--	--	--	--	na	2.9E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	--	--	--	--	--	--	--	--	na	7.7E+02
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	--	--	na	9.1E+01
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	--	--	na	na
1,2-Diphenylhydrazine[C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	--	--	na	5.4E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	--	--	na	2.4E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	na	8.1E-01
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	--	--	--	--	--	--	--	--	na	8.1E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+04**
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.7E+02**
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+04**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**2.1E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**1.1E-03**
Hexachlorobenzene[C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.7E-03**
Hexachlorobutadiene[C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.0E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	--	na	6.3E-01	--	--	--	--	--	--	--	--	**9.5E-01**	**--**	**na**	**6.3E-01**
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+04**
Hexachloroethane[C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**2.0E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	1.5E+02	1.7E+01	na	--	1.5E+02	1.7E+01	na	--	--	--	--	--	--	--	--	--	**1.5E+02**	**1.7E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	--	--	--	--	--	--	--	--	**1.4E+00**	**7.7E-01**	**na**	**5.1E-02**
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+03**
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E-02**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+04**
Nickel	0	2.2E+02	2.4E+01	na	4.6E+03	2.2E+02	2.4E+01	na	4.6E+03	--	--	--	--	--	--	--	--	**2.2E+02**	**2.4E+01**	**na**	**4.6E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+03**
N-Nitrosodimethylamine[C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+01**
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	**6.5E-02**	**1.3E-02**	**na**	**--**
PCB-1016	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1221	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1232	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1242	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1248	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1254	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB-1260	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**--**
PCB Total[C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E-03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	7.7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	**7.7E-03**	**5.9E-03**	**na**	**8.2E+01**
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.6E+06**
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+00**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+00**
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+04**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.0E+01	5.0E+00	na	1.1E+04	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**na**	**1.1E+04**
Silver	0	4.9E+00	--	na	--	4.9E+00	--	na	--	--	--	--	--	--	--	--	--	**4.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+02**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.3E+00**
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.3E-01	2.0E-04	na	7.5E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**na**	**7.5E-03**
Tributyltin	0	4.6E-01	6.3E-02	na	--	4.6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	**4.6E-01**	**6.3E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.4E+02**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.2E+02**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.1E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.1E+01**
Zinc	0	1.4E+02	1.4E+02	na	6.9E+04	1.4E+02	1.4E+02	na	6.9E+04	--	--	--	--	--	--	--	--	**1.4E+02**	**1.4E+02**	**na**	**6.9E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens,
   Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+03
Arsenic	9.0E+01
Barium	na
Cadmium	8.0E-01
Chromium III	5.2E+01
Chromium VI	6.4E+00
Copper	6.4E+00
Iron	na
Lead	1.0E+01
Manganese	na
Mercury	5.1E-02
Nickel	1.4E+01
Selenium	3.0E+00
Silver	1.9E+00
Zinc	5.5E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

ALEXANDRIA SANITATION AUTHORITY
1500 EISENHOWER AVENUE
P. O. BOX 1987
ALEXANDRIA, VIRGINIA 22313-1987

TEL. 703-549-3381

RECEIVED
AUG 29 2006
Northern Va. Region
Dept. of Env. Quality

August 25, 2006

Virginia Department of Environmental Quality
Northern Virginia Regional Office
Attn: Thomas Faha
13901 Crown Court
Woodbridge, Va. 22193

Subject: VPDES Permit for Alexandria Sanitation Authority, No. VA0025160
Analysis, Submittal of pH and Temperature Monitoring Data for Hunting Creek

Dear Mr. Faha:

As required by Special Condition #11 of the VPDES Permit No. VA0025160, the Alexandria Sanitation Authority is submitting pH and temperature monitoring for the Hunting Creek receiving water, along with analysis for ammonia criteria.

It is my understanding that this fulfills this special condition in its entirety. Please feel free to contact me if you have any questions.

Sincerely,

Karen L. Pallansch
Engineer-Director

Enclosure

Cc: File

Professionals working together to protect the environment for today and tomorrow

CITY OF ALEXANDRIA, VIRGINIA
SANITATION AUTHORITY

Ambient Water Quality Data Collection

Preliminary Data Analysis for Ammonia Criteria

Greeley and Hansen
July 2006

Introduction

The Alexandria Sanitation Authority (ASA) wastewater treatment plant discharges treated effluent to Hunting Creek, a tributary of the Potomac River. In 2004, the Virginia Department of Environmental Quality (VDEQ) reissued the VPDES Permit for the ASA WWTP (VA0025160) with an effective date of January 20, 2009. As part of the permit, the ASA was required to submit one year of pH and temperature monitoring for the receiving water, along with analysis, to the VDEQ by August 31, 2006.

Procedure

Water Quality Data collected by the Woodrow Wilson Bridge Project (WWBP) Team was examined for the period April 2004 – May 2006. Tom Faha from VDEQ approved use of this data as a substitute for the ambient water quality data to be collected by the ASA under the permit conditions. Due to sampling gaps in the period, May 2004 – April 2005, this data analysis covers the period of May 2005 – May 2006.

One year of water quality data (temperature, pH) for Station 5 from the Woodrow Wilson Bridge Project (WWBP) was examined. Station 5 is located on Hunting Creek near the George Washington Memorial Parkway (see Figure 4).

Following is the description of data collection activities from the Woodrow Wilson Bridge Project:

> Data was sampled and logged every 15 minutes, using a YSI 6920 data sonde. The sondes are housed in vented PVC tubes eight feet long attached to stable structures in the river. Data from all the stations are downloaded every one to two weeks. The meters are inspected during download; field maintenance and calibration is performed as needed (e.g. replace batteries, replace DO membranes, clean algae).
>
> Comparative water quality data is collected at each fixed station prior to every data download to evaluate the accuracy of the logged data. Water quality data collected during the comparative reading include temperature, dissolved oxygen, pH and turbidity. This data is taken using a freshly calibrated YSI 6920 sonde.

All data collected for the time period selected was used in the analysis, following the QA/QC procedure determined by the WWBP. A final written report on the sampling data, including QA/QC results, is expected to be available from the WWBP in July 2006, and until the written report, data should be considered preliminary.

Analysis

Data were entered and analyzed in a spreadsheet format. pH and temperature measurements were plotted against time (Figure 1 and Figure 2). Acute and chronic water quality criteria for ammonia were calculated based on the pH and temperature data for each 15 minute using the formulas utilized by the VDEQ and contained in EPA Guidance Documents for Ammonia (Appendix A. Calculation of Instream Chronic Criteria) In addition, a 30-day rolling average was computed (30 days forward) where such data was available (Figures 3.)

pH and temperature data were compared to the conditions used in the ammonia criteria calculations for the Alexandria Sanitation Authority (ASA) permit VA0025160. Ammonia criteria and resulting permit limits were calculated using two alternative methods:

(1) 50th percentile of pH and Temperature Data; and
(2) 10th percentile of the 30-day rolling averages[1] of the ammonia criteria calculated from 15-minute pH and Temperature data.

These two methods result in calculated chronic ammonia criteria similar to or lower than the ammonia criteria in the existing permit.

These results were compared to the criteria calculated by the VDEQ as part of the ASA permit VA0025160 (Table 1). The VDEQ used the 50th percentile of pH and Temperature data available, and calculated ammonia criteria based on these numbers.

Table 1 shows what similar calculations would yield using the 50th percentile of the pH and temperature data collected for Station 5 of the WWBP. In addition, criteria were calculated based on the 10th percentile of the 30-day rolling averages of the ammonia criteria calculated from 15-minute pH and Temperature data. (The 10th percentile was used, as opposed to the 90th percentile, because it is the *lowest* criteria that is desired for this analysis.)

In addition to the ammonia criteria, calculated permit limits were determined using In-stream Waste Concentration values of 83% (Nov – March) and 91% (April – October) as shown on Page 8 of the VA0025160 permit fact sheet.

---

[1] Note that there are several methods of calculating a 30-day rolling average. The calculation utilized here was the *thirty-day rolling average that included the current day then the next 30 days.* This method was compared to other methods including selecting the current day and 30 days prior, and choosing the current day and 15 days before and after. The resulting rolling averages were all similar, and the 30 day forward method resulted in the lowest (i.e. more conservative) ammonia criteria for the Spring and Summer periods. The 30 day forward method was approx 0.04 mg/L higher for Winter period than the 30 day backward calculation. This was considered to be within the acceptable level of variation

Results and Discussion

Based on the analysis shown in Table 1, the values calculated for the ammonia criteria are similar or lower than the criteria calculated in the ASA permit. Of the two methods utilized, the 10th percentile of the 30-day rolling average is a more conservative approach towards protecting aquatic life, and results in lower ammonia criteria for each season.

Table 1. Current and Calculated Criteria and Permit Limits

Current Criteria, Limits From VPDES VA0025160 FACT SHEET Page 5

Table 3 – Acute and Chronic Ammonia Criteria					
Season	50th percentile pH (s.u.)	50th percentile Temp (ºC)	Acute Ammonia as N (mg/L)	Chronic Ammonia as N (mg/L)	**Actual Permit Limit**
Nov 1 – Feb 14*	7.0	11.9	36.09	7.0	8.4 mg/L
Feb 15 – Mar 31**	6.9	9.0	39.16	6.12	7.4 mg/L
Apr 1 – Oct 31(PES months)	7.06=7.1	23.3	32.86	3.22	1.0 mg/L

*Early Fish Life Stages Absent Criteria
** Early Fish Life Stages Present Criteria

Method (1): 50th Percentile of pH and Temperature Data

Acute and Chronic Ammonia Criteria Based on 2005-2006 Data (50th Percentile)					
Acute and Chronic Ammonia Criteria					
Season	50th percentile pH (s.u.)	50th percentile Temp (ºC)	Acute Ammonia as N (mg/L)	Chronic Ammonia as N (mg/L)	**Calculated Permit Limit**
Nov 1 – Jan 31*	7.2	10.1	NC	7.1	**8.6 mg/L**
Feb 1 –Mar 31*	7.3	12.2	NC	5.9	**7.1 mg/L**
Feb 1 – Mar 31**	7.3	12.2	NC	5.1	**6.1 mg/L**
Apr 1 – Oct 31 (PES months)	7.1	24.3	NC	3.0	1.0 mg/L

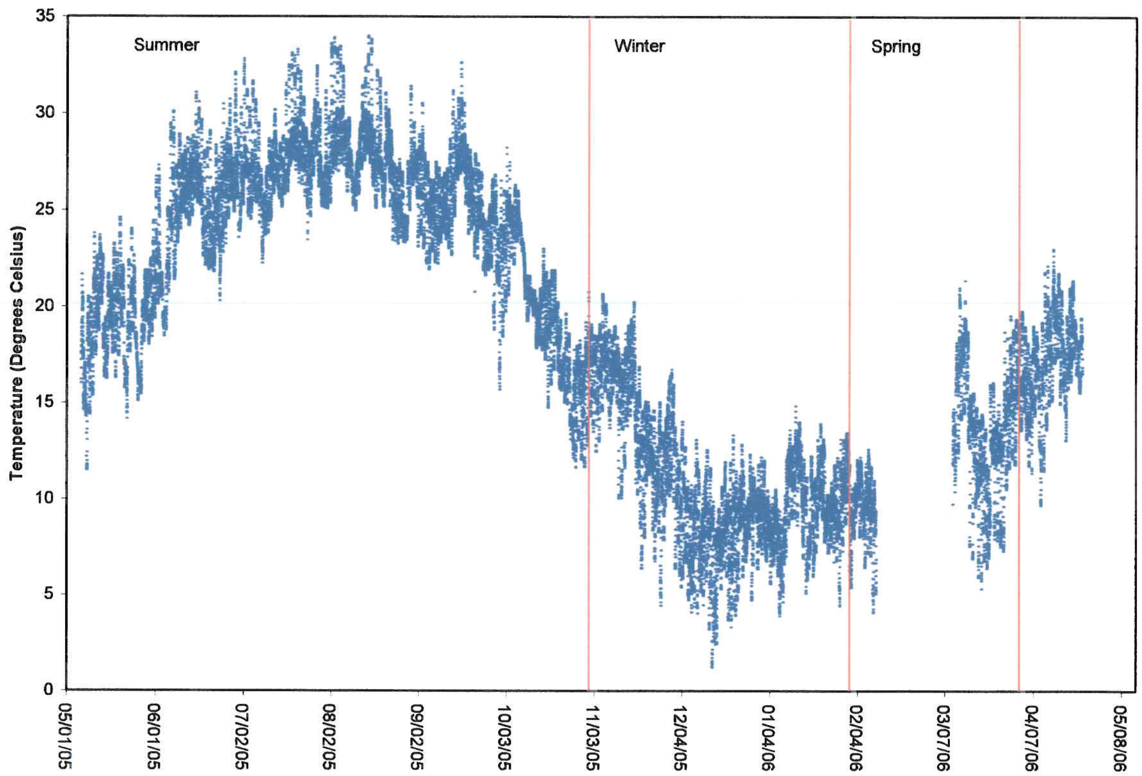
*Early Fish Life Stages Absent Criteria
** Early Fish Life Stages Present Criteria

Method (2): 30-day rolling average of Ammonia Criteria calculated from 15-minute pH and Temperature Data

Acute and Chronic Ammonia Criteria Based on 2005-2006 Data (10th percentile of 30 average criteria)			
Acute and Chronic Ammonia Criteria			
Season	Acute Ammonia as N (mg/L)	Chronic Ammonia as N (mg/L)	**Calculated Permit Limit**
Nov 1 – Jan 31*	NC	5.6	**6.7 mg/L**
Feb 1 – Mar 31*	NC	4.5	**5.4 mg/L**
Feb 1 – Mar 31**	NC	4.4	**5.3 mg/L**
Apr 1 – Oct 31 (PES months)	NC	2.3	1.0 mg/L

*Early Fish Life Stages Absent Criteria
** Early Fish Life Stages Present Criteria

Figure 1. Temperature Data at Woodrow Wilson Bridge Project Station No. 5, May 2005 – May 2006



Appendix A

Calculation of Instream Chronic Criteria
Chronic Toxicity as defined by VWQS:

(9 VAC 25-260-140) "Chronic toxicity" means an adverse effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a pollutant. This includes low level, long-term effects such as reduction in growth or reproduction.

This criterion is further defined as:

(9 VAC 25-260-155b) The thirty-day average concentration of total ammonia nitrogen (in mg N/L) where early life stages of fish are present in freshwater shall not exceed, more than once every three years on the average2, the chronic criteria below:

$$ChronicCriteriaConcentration = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \times MIN$$

Where MIN = 2.85 or $1.45 \times 10^{0.028(25-T)}$, whichever is less.
T = temperature in °C

(9 VAC 25-260-155c) thirty-day average concentration of total ammonia nitrogen (in mg N/L) where early life stages of fish are absent (procedures for making this determination are in subdivisions1 through 4 of this subsection), in freshwater shall not exceed, more than once every three years on the average3, the chronic criteria below:

$$ChronicCriteriaConcentration = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \times 1.45\left(10^{0.028(25-MAX)}\right)$$

Where MAX = temperature in °C or 7, whichever is greater.

Calculation of Instream Acute Criteria
Acute Toxicity is defined by VWQS as:

(9 VAC 25-260-140) "Acute toxicity" means an adverse effect that usually occurs shortly after exposure to a pollutant. Lethality to an organism is the usual measure of acute toxicity. Where death is not easily detected, immobilization is considered equivalent to death.

This criterion is further defined as:

(9 VAC 25-260-155) The one-hour average concentration of total ammonia nitrogen (in mg N/L) in freshwater shall not exceed, more than once every three years on the average, the acute criteria below [Trout absent]:

$$AcuteCriterionConcentration = \left(\frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}\right)$$

Figure 2. pH Data at Woodrow Wilson Bridge Project Station No. 5, May 2005 – May 2006

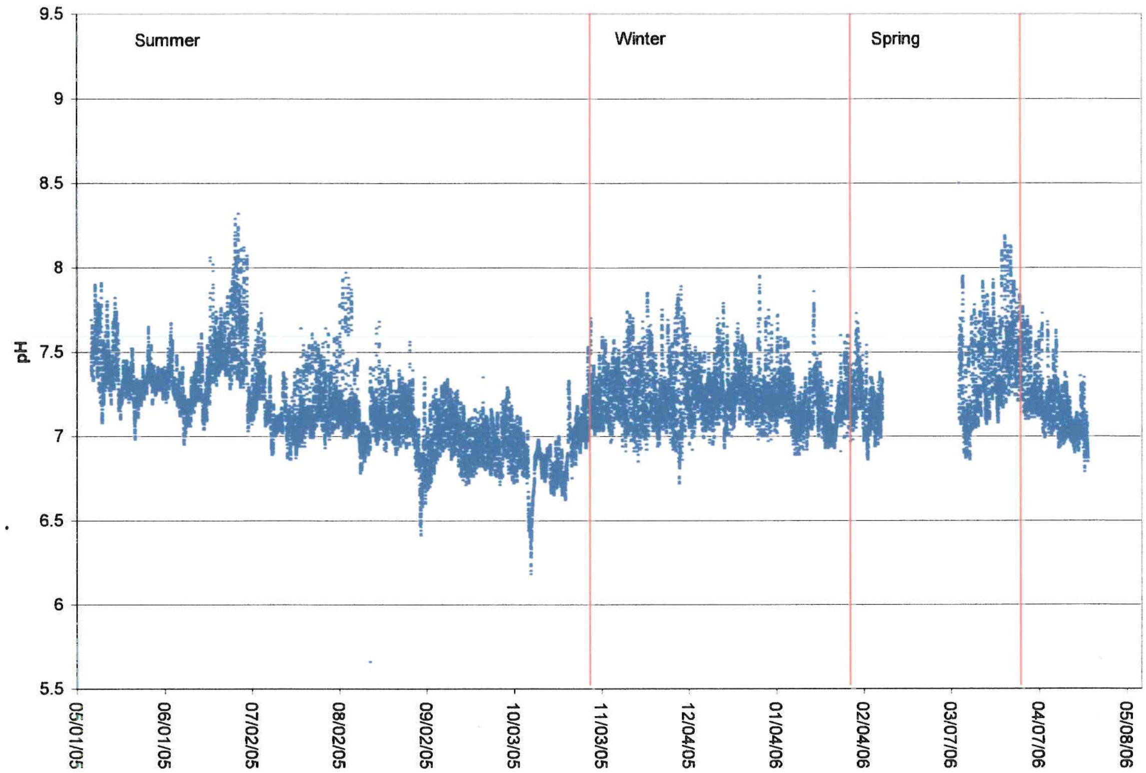


Figure 3. Chronic Ammonia Criteria, 30-day averages

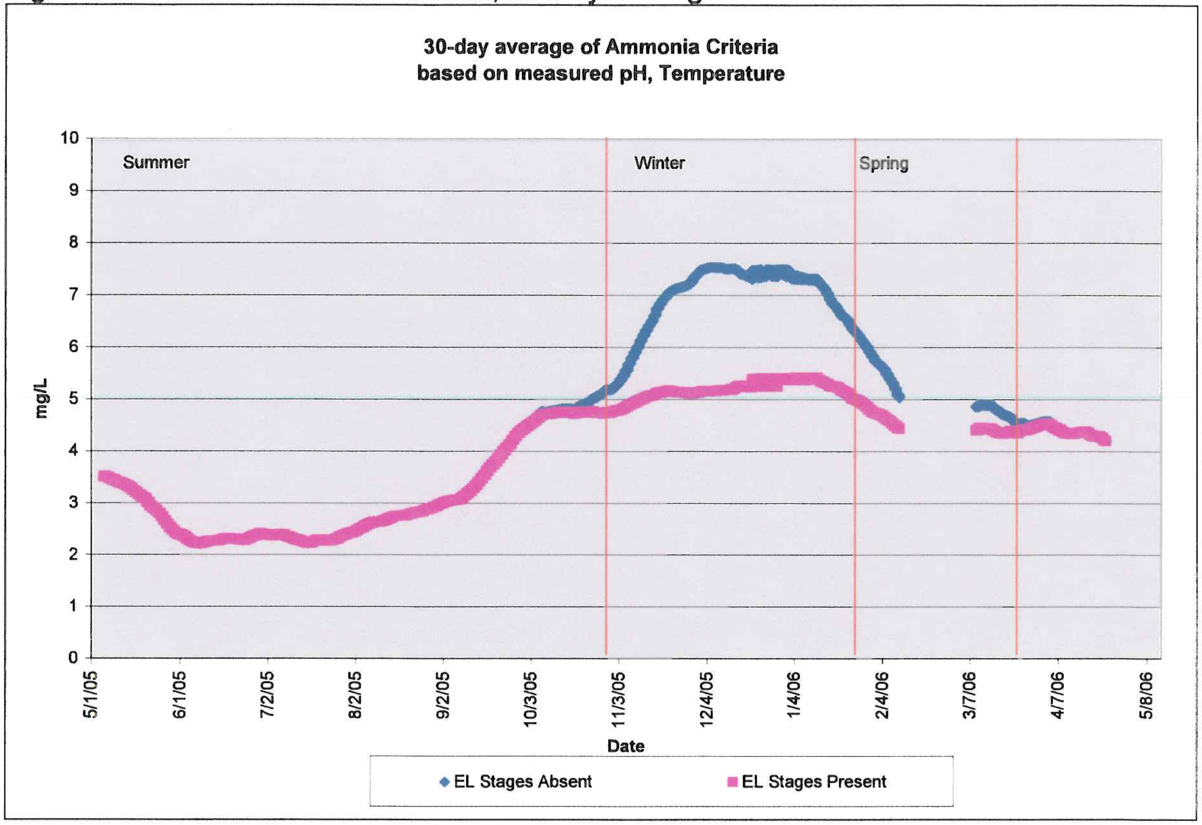
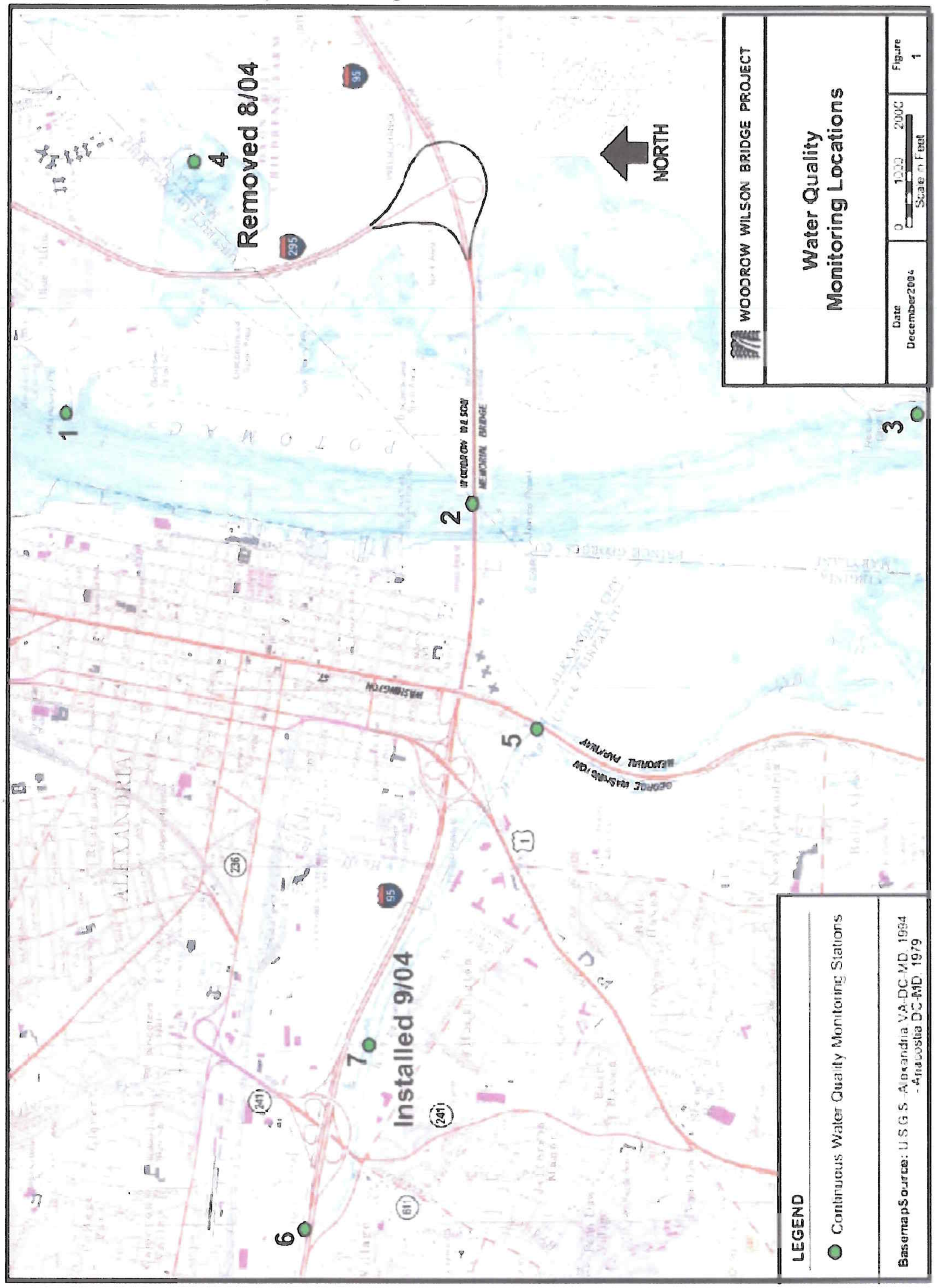


Figure 4. Water Quality Monitoring Locations



Ambient Monitoring Data
1aHUT000.01

City of Alexandria, Sanitation Authority
38° 47' 23" / 77° 03' 06"

Collection Date Time	pH (S.U.)	DO (mg/L)	Temp (°C)	Hardness (as mg/L CaCO3)
1/22/04 1:10 PM	7.16	12.03	7.74	
3/22/04 1:10 PM	7.55	11.74	10.97	
6/24/04 4:55 PM	7.19	9.35	26.8	92
7/12/04 2:22 PM	7.76	10.41	28.42	108
9/8/04 1:00 PM	7.29	5.79	24.72	120
11/2/04 4:45 PM		9	20.61	114
1/19/05 12:10 PM	7.58	11.71	3.78	94
3/9/05 2:45 PM	7.19	12.7	9.05	98
7/19/05 11:40 AM	6.83	6.84	28.58	91
8/30/05 11:45 AM	7.06	5.69	25.36	51
9/22/05 11:45 AM	7.39	6.83	24.74	144
11/28/05 1:45 PM	7.07	9.95	14.66	103
1/18/06 1:30 PM	7.29	11.04	10.39	57
3/14/06 2:05 PM	7.2	10.3	17.6	99
1/30/08 10:40 AM	7.4	11.8	8.7	
3/3/08 11:16 AM	6.9	11	12.8	

Average	7.26	9.76	17.2	98
90th Percentile	7.568		27.6	

Nov. - Jan.
7.16
7.58
7.07
7.29
7.4

50th Percentile	7.3
90th Percentile	7.5

Nov. - Jan.
7.74
20.61
3.78
14.66
10.39
8.7

50th Percentile	9.5
90th Percentile	17.6

Feb. - March
7.55
7.19
7.2
6.9

50th Percentile	7.2
90th Percentile	7.4

Feb. - March
10.97
9.05
17.6
12.8

50th Percentile	11.9
90th Percentile	16.2

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Office of Permit Support
629 East Main Street Richmond, Virginia 23219

MEMORANDUM

Subject: Alexandria Dilution

To: April Young, NRO

From: M. Dale Phillips Dale

Date: August 8, 1997

Copies:

RECEIVED
AUG 14 1997
Northern VA. Region
Dept. of Env. Quality

I have reviewed the dilution studies submitted by Greeley and Hansen on behalf of the Alexandria Sanitation Authority and have the following comments:

1. The general approach seems to be consistent with our approach to controlling toxics, e.g., to ensure that passing or drifting organisms are not exposed to concentrations higher than the criterion for longer than the time specified in the standards.

2. The models used seem to be adequate for the approach taken. However, I would like to see some discussion of the means used to verify that DYNHYD is providing reasonable predictions.

3. The use of 2 days exposure rather than 4 days in our guidance has nothing to do with the presence of additional sources of pollutants. It was specifically to provide a conservative estimate to account for uncertainty associated with the models used for estimating the exposure time. I do not believe that the models in this study and the resulting predictions are sufficiently accurate to ignore some margin of safety. If they do not want to use the default of 2 days then I would suggest that they recommend some more valid factor and justify it.

   I would add that whatever the resolution of this issue the safety factor chosen will eventually have to pass the margin of safety criteria in the EPA TMDL guidance because this stream segment will require development of a TMDL in the very near future.

4. The report should address "passing" organisms as well as drifting ones. This is a minor point and it may be that they are not of concern due to the small stream above the embayment but the subject should be addressed as free swimming organisms may spend more time in the embayment than would planktonic ones. Particularly if they spawn there.

5. In my opinion, the comparison between effluent data and

STORET data is essentially meaningless. The data were obtained at different locations and most of the data were obtained on different days. No attempt was made (probably cannot be made) to link cause and effect between the two data sets. The only use of such data that occurs to me is a simple statistical test to demonstrate that the data are from different populations.

Further, the calculation and reporting of numerical reduction factors based on such data is potentially extremely misleading and should be eliminated from the report.

6. Figure 2, on the other hand, is extremely informative and I would suggest that it be moved into section 3.2.

Memorandum

Department of Environmental Quality
Northern Virginia Regional Office

13901 Crown Court   Woodbridge, Virginia   22193   703/583-3800

To: Dale Phillips

cc: A. Laubscher
L. Collier
A. Young

From: Tom Faha

Date: August 20, 1997

Subject: Mixing Zone Analyses for Lower Potomac STP and Alexandria STP

Greeley and Hansen has prepared chronic dilution analyses for the Alexandria and Lower Potomac STPs. You have already reviewed and commented on the Alexandria analysis. The Lower Potomac analysis is enclosed and we ask for your review and comment on it.

It is our consensus that the mixing zones and complete mix assumptions proposed by Greeley and Hansen are not appropriate for either receiving stream, Hunting Creek for Alexandria, or Pohick Creek for Lower Potomac. Although the proposals, with further documentation, may meet the exposure criteria set forth in Guidance Memo 93-015 Amendment No. 1 for passing and drifting organisms, we believe that they would violate the Use Designation standard (9 VAC 25-260-10) and the General Standard (9 VAC 25-260-20). Both proposals would cause whole segments of the receiving streams to violate standards continuously and thereby risk the beneficial uses of these waters.

Again, please review and comment on the proposal for Lower Potomac as well as our assessment of the proposal(s).

Thank you.

CO MONWEALTH OF VI INIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
Office of Permit Support

629 East Main Street   Richmond, Virginia 23219

MEMORANDUM

Subject: Potomac Embayments and Mixing zones

To: Tom Faha, NRO

From: M. Dale Phillips, OPS Dale

Date: August 27, 1997

RECEIVED
SEP 4 1997
Northern VA. Region
Dept. of Env. Quality

Copies:

I too am concerned with the approach being used for the analysis of mixing zones in the Potomac embayments. We accepted an analysis using the VIMS models for Neabsco Creek based on several considerations only part of which was actually related to the model's predictions. Those considerations include:

- Neabsco Creek is relatively wide compared to its length.
- The location of the discharge is in the tidal portion of the Creek relatively near the mouth.
- The model indicated very rapid tidal flushing.
- Effluent flow is small compared to volume of the embayment.
- It was our opinion based on the above points that it was unlikely that the effluent would adversely impact either the entire width or the overall ecology of this particular system.

However, our acceptance of the Neabsco Creek proposal has apparently been interpreted by the other embayment dischargers and/or their representatives as a green light for wholesale application of complete mix models coupled with tidal flushing considerations for all the embayments regardless of the physical situation or other concerns that would make the approach unacceptable for reasons that have nothing to do with the model.

For embayments that are long, narrow and shallow, monitoring data, model predictions and experience indicate that the water quality is almost totally a function of the effluent quality. In these situations the entire body of the embayment will always have concentrations that exceed the standard. The exceedances are not episodic as allowed for by the standard.

The application of the approach to the Lower Potomac STP is perhaps the most extreme example. That discharge is actually to the free flowing portion of Pohick Creek, in fact, the discharge is essentially all of the flow in Pohick Creek for the last mile or so of the free flowing section. Once mixing in Pohick Creek is complete (probably a matter of yards) the standards apply. The rate of tidal flushing in Gunston Cove or the tidal part of Pohick Creek has no relationship whatsoever to a mixing zone at the discharge location.

As I indicated in [illegible] review of the Alexandria study and will again indicate for the Lower Potomac study, the concept is consistent with our general guidance relating to acceptance of complete mix assumptions based on exposure times in free flowing streams.

However, regardless of model accuracy or appropriateness, the guidance also advises the permit writer to abandon the guidance in those cases where they believe (based on their superior knowledge of the local situation) that it is not applicable (tidal waters, lakes, etc.) where resident organisms require protection or where the ecology of the system when considered as a whole will be adversely impacted.

I was somewhat remiss in not fully discussing these issues when we evaluated the Neabsco Creek proposal and apologize for any inconvenience that it has caused.

I agree with your assessment that these considerations render the concepts in our guidance not applicable to the Alexandria STP regardless of model predictions.

Relative to the Lower Potomac STP analysis, the modeling was performed properly but inappropriately applied because the discharge is to a free flowing stream. I cannot recommend acceptance of the analysis as a basis for establishing either the mixing zone or effluent limits for this facility. The mixing zone is located in the free flowing stream and consequently a mixing analysis is appropriate only for areas very near the discharge point. Based on the printouts that you sent, I believe that your application of the free flowing mixing guidance is appropriate. Tidal flushing or time of travel considerations are simply not applicable to the mixing of this effluent with its receiving stream.

I would be willing to reconsider the analysis if the discharge location were moved to a point near the mouth of Gunston Cove where the effluent may not completely dominate the water quality and ecology of the system.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

George Allen
Governor

Becky Norton Dunlop
Secretary of Natural Resources

Northern Virginia Regional Office
13901 Crown Court
Woodbridge, VA 22193
(703) 583-3800
Fax (703) 583-3801

Thomas L. Hopkins
Director

Gregory L. Clayton
Regional Director

September 9, 1997

Mr. James T. Canaday
Engineer-Director
Alaexandria Sanitation Authority
Post Office Box 1987
Alexandria, Virginia 22313

Re: VPDES Permit No. VA0025160 Alexandria Sanitation Authority
Mixing Zone Analysis

Dear Mr. Canaday:

Enclosed is DEQ's review of the *Hunting Creek Dilution Study*. As discussed in the review, we believe the results of the dilution study are not appropriate for the receiving stream.

If you have any questions concerning DEQ's review, please call me at (703) 583-3846.

Sincerely,

Thomas A. Faha
Water Permit Manager

Enclosure

ALEXANDRIA SANITATION AUTHORITY
835 SOUTH PAYNE STREET
P. O. BOX 1987
ALEXANDRIA, VIRGINIA 22313-1987

TEL. 703-549-3381

September 25, 1997

RECEIVED
SEP 29 1997
Northern VA. Region
Dept. of Env. Quality

Mr. Thomas A. Faha
Water Permit Manager
Northern Virginia Regional Office
Department of Environmental Quality
13901 Crown Court
Woodbridge, VA 22193

Dear Mr. Faha:

I am in receipt of your letter to Mr. Canaday dated September 9, 1997, the attached memo to Dale Phillips from you dated August 20 and his return memo dated August 27. Also, I have received from Ms. Young, Dale Phillips' memo dated August 8. After reviewing these documents along with the *Hunting Creek Dilution Study* prepared by Greeley and Hansen, I can not concur with your conclusion that "the results of the dilution study are not appropriate for the receiving stream."

While I concur that you are not bound by guidance and may "abandon the guidance" when it is demonstrated to be inappropriate, you have not made any demonstration the dilution study is not appropriate to Hunting Creek. You state in your August 20 memo that "Both proposals would cause whole segments of the receiving streams to violate standards continuously..." You do not state which segments you believe would be in continuous violation or on what basis you make that determination.

Mr. Phillips' response memo of August 27, addresses the dilution study performed for Gunston Cove. He states that "the modeling was performed properly but inappropriately applied because the discharge is to a free flowing stream." No technical analysis is made of the *Hunting Creek Dilution Study* in this memo. Clearly, our discharge is to the tidal portion of Hunting Creek and therefore our situation must be analyzed separately from the Lower Potomac study.

I believe Mr. Phillips' August 8 memo is the appropriate starting point for further discussions in that it actually addresses the situation in Hunting Creek. In his first paragraph, he states that "The general approach seems to be consistent with our approach to controlling toxics..." In his second paragraph, he states that "The models used seem to be appropriate..." He goes on to raise some valid technical questions. We are quite willing to address these points and apply the best possible science to determine the correct resolution of these issues.

Mr. Phillips' final paragraph states that, "Figure 2,...,"is extremely informative and I would suggest it be moved into section 3.2" That figure indicates the extreme influence of tidal action on the entire Hunting Creek system from the Potomac River to Segment 11. It is not at all clear to me which segment you believe to "violate standards continuously."

One final note, Mr. Phillips states that "In my opinion, the comparison between effluent data and STORET data is essentially meaningless." That comparison was requested by your staff. The Authority, through it's paid consultants, spent considerable effort making the requested analysis.

In summary, I believe the results of the dilution study are appropriate to the receiving stream. While there are minor technical issues to be clarified, you have not justified rejecting the results. Mr. Phillips' first memo substantially supports our position. Your rejection seems more based on the situation at Lower Potomac than at Alexandria. Each embayment study must be evaluated on its own merits.

Thank you for your time and attention. We look forward to resolving the issues raised by Mr. Phillips in his August 8 memo.

Sincerely,

Glenn B. Harvey
Deputy Engineer-Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

George Allen
Governor

Becky Norton Dunlop
Secretary of Natural Resources

Northern Virginia Regional Office
13901 Crown Court
Woodbridge, VA 22193
(703) 583-3800
Fax (703) 583-3801

Thomas L. Hopkins
Director

Gregory L. Clayton
Regional Director

October 20, 1997

Mr. Glenn B. Harvey
Deputy Engineer-Director
Alexandria Sanitation Authority
835 South Payne Street
P.O. Box 1987
Alexandria, Virginia 22313-1987

Dear Glenn:

This letter is a response to your September 25, 1997, letter to me regarding the dilution and mixing zone study being conducted by Alexandria Sanitation Authority (ASA). I apologize for the delay in this response but other matters concerning ASA have taken precedent.

The brevity of my September 9, 1997, letter to ASA was based on our belief that the enclosed memos explained our position for Hunting Creek and Pohick Creek.. It is our opinion that the Pohick Creek study was the more extreme of the two studies but our concerns with the Hunting Creek study are discussed in the memos as well.

We believe the complete mix assumptions used with exposure periods as outlined in the study present a reasonable threat to the Use Designation Standard and the General Standard for those Hunting Creek segments closest to the outfall. As outlined in the August 27, 1997, memo, staff has concerns about using complete mix assumptions for large discharges like ASA that discharge into comparatively small waterbodies. The result is a whole discernable segment of the waterbody being predominantly effluent. If the effluent does not meet chronic standards then the waterbody segment will not meet the requirements of the above standards. The further application of exposure periods for calculation of chronic limits, per DEQ's mixing zone guidance for the protection of passing and drifting organisms, would only extend the size of the non-attainment segment(s). The use of downstream dilution factors would result in the upstream segments being in continual violation of chronic standards.

Your letter states your intention to proceed with the study by addressing the comments in staff's August 8, 1997, memo. The decision to proceed with the study is entirely ASA's and we will review all submittals. However, we recommend that you consider and address the above comments before addressing the items in the August 8 memo. Please call me at 703/583-3846 with any questions you may have.

Respectfully,

Thomas A. Faha
Water Permits Manager

cc: A. Young

ALEXANDRIA SANITATION AUTHORITY

835 SOUTH PAYNE STREET
P. O. BOX 1987
ALEXANDRIA, VIRGINIA 22313-1987

TEL. 703-549-3381

March 19, 1998

Ms. April Young
Department of Environmental Quality
Northern Regional Office
13901 Crown Ct.
Woodbridge, VA 22193

Dear Ms. Young:

Enclosed are several documents relating to studies conducted for the Alexandria Sanitation Authority regarding appropriate permit Dissolved Oxygen (D.O.) values and development of dilution rates from the VIMS Tidal Prism Model (TPM). The documents include:

* Memo dated 2/4/98 from Mike Sullivan, Limno-Tech, Inc., "Documentation of TPM Application for Hunting Creek Dilution Analysis"

* Letter dated 1/28/98 from Mark Kennedy, Greeley and Hansen, "Tidal Prism Model Assesment of Instream Dissoved Oxygen in Hunting Creek Embayment"

* Memo dated 1/21/98 from Mike Sullivan, Limno-Tech, Inc., "Documentation and Results for Hunting Creek Disolved Oxygen Analysis"

* Report dated June 1997, Greeley and Hansen, "Technical Memorandum Hunting Creek Dilution Study for the Alexandria Sanitation Authority Wastewater Treatment Plant" (originally submitted June 18, 1997)

* Excerpts from report dated December 1987, Council of Governments, "A Dissolved Oxygen Study of the Upper Potomac

Memorandum

RECEIVED FEB 12 1998 GREELEY & HANSEN WASHINGTON OFFICE

TO: Mark Kennedy, Greeley and Hansen **DATE:** 02/04/98

PROJECT: ALX4

FROM: Mike Sullivan, Limno-Tech, Inc.

SUBJECT: Documentation of TPM Application for Hunting Creek Dilution Analysis

---

We completed a modeling analysis of dilution in Hunting Creek Embayment during 1997. The analysis focused on quantifying the amount of dilution available in Hunting Creek in the vicinity of the ASA WWTP discharge under design flow conditions. The analysis was conducted through application of the Tidal Prism Model (TPM) developed by VIMS (Diana et al, 1987). The results of the dilution analysis were transmitted to you in a Fax/Memo with accompanying tabular summaries dated March 31, 1997. The intent of this memorandum is to document how the model was applied to quantify dilution.

Technical Approach

The technical approach used to quantify dilution is as follows:

- CBOD, a state variable in TPM, was simulated as a conservative substance to track dilution in Hunting Creek. Other systems simulated by TPM were essentially not relevant and were ignored

- A fixed amount of CBOD was established as a constant model input for the ASA WWTP. This was 4,510 lbs of CBOD/day, assuming a discharge of 54 MGD, and an effluent concentration of 10 mg/l of CBOD.

- No other sources of CBOD were included in the analysis (e.g., the upstream input was set to zero).

- No CBOD loss mechanisms were implemented (e.g., the settling rate of CBOD was set to zero, the CBOD decay coefficient was set to zero).

- Design flow conditions for summer (7Q10 = 2.5 cfs) and winter (7Q10 = 5.2 cfs) were implemented, and the TPM was run for 30 tidal cycles to reach a steady state condition.

- The instream concentrations for CBOD predicted by the TPM provided the basis for calculating dilution as the WWTP is the only source, with no sinks or losses. Dilution was calculated for each model segment. TPM predicts the CBOD concentration at high tide. A VIMS recommended procedure is used to estimate the concentration at low tide. Average dilution is based upon the arithmetic average of high and low tide values.

f:\alx4\memos\docmemo.doc

```
   30     2     0     0     6
   29    30
 Hunting Creek: TPM Dilution Analysis March 1997
   11    0
    1   11      main channel
 0.00        0.33        0.50        0.76        0.95        1.14        1.33
 1.52        1.70        1.89        2.75
 0.00        27.61       10.68       3.20        0.90        0.81        0.69
 0.56        0.49        0.32        1.95
 28.97       11.59       4.96        2.98        2.44        1.91        1.40
 0.94        0.52        0.24        0.00
 0.00        0.00        0.60        0.00        0.00        0.00        0.00
 0.00        0.00        0.00        0.00
 3.10        4.50        7.10        3.20        2.90        2.40        2.00
 1.70        1.40        1.20        0.50
    99.
 Dilution Analysis - Physical Data Sets
 1  main channel
    1     1    WATER TEMPERATURE
28.8
    2    11    INITIAL CONDITIONS
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
    3     1    POINTSOURCE WASTEWATER
    6             83.6          0.          0.          0.          0.
                    0.          0.       4510.          0.          0.
    4     1    NON-POINT SOURCES
 11    2.50        0.          0.          0.          0.          0.          0.          0.
    5    11    BENTHIC OXYGEN DEMAND (SOD)
1.065
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
    6    11    TURBIDITY (LIGHT EXTINCTION)
3.50 4.00 5.10 5.90 5.90 6.00 6.00 6.10 6.10 6.20 6.30
    7    11    CBOD DECAY COEFFICIENT
1.047
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
    8     1    DOWNSTREAM BOUNDARY CONDITIONS
00.0
         0.          0.          0.
         0.          0.
         0.
         0.          0.
         0.
 99
999
1.0          1.0         1.0         1.0
1.0          1.0         1.0
0.0          0.0
1.0          1.0         1.0         1.0         1.0         1.0         1.0
1.0          1.0         1.0         1.0         1.0
1.0
1.0
```

GREELEY AND HANSEN

ENGINEERS

8905 PRESIDENTIAL PARKWAY • SUITE 230 • UPPER MARLBORO, MD 20772
(301) 817-3700 • FAX (301) 817-3735

January 28, 1997

Mr. Glenn Harvey
Alexandria Sanitation Authority
835 S. Payne Street
P.O. Box 1987
Alexandria, VA 22313

Subject: Tidal Prism Model Assessment of Instream Dissolved Oxygen in Hunting Creek Embayment

Dear Mr. Harvey:

This letter is to transmit to you the results of the subject modeling and recommendations for permit limits for the Alexandria Sanitation Authority (ASA) Wastewater Treatment Plant (WWTP). As you know, the Northern Virginia Planning District Commission (NVPDC) completed the Potomac Embayments Wasteload Allocation Study[1] to determine what effluent limits were necessary for the several WWTPs which discharge treated effluent into the waters of the Upper Potomac Estuary.

The recommended effluent limits for the ASA WWTP based on instream dissolved oxygen and eutrophication (as measured by chlorophyll-a) were as follows:

Seasonal Condition	Plant Flow	Recommended Effluent Concentrations (mg/L)			
		DO	$CBOD_5$	TKN	TP
Summer	54 MGD	7.6	3.0	20*	1.0
		----- OR -----			
		7.6	10	1.0	1.0
Winter	54 MGD	6.0	10	20*	1.0
* Indicates no nitrification needed.					

[1]NVPDC, "Potomac Embayments Wasteload Allocation Study," Vol. III, June 30, 1988.

data, well above the 90th percentile typically used in permitting assessments. The TPM results show that instream DO standards are met at any effluent DO ranging from 6.0 to 7.6 mg/L.

Sediment oxygen demand is a measure of the instream oxygen depletion due to biochemical activity in the stream sediments. SOD levels from both the 1988 report and expected SOD levels based on best professional judgement were used in this TPM rerun and the resulting effects on instream DO compared. The results indicate a dramatic affect due to the SOD levels in TPM segments 4, 5 and 6. We believe that the relatively high SOD values in these segments have diminished over the past 15 years or so and that a lower estimate is warranted unless new data suggests otherwise. However, even with the higher 1980's SOD values, instream DO standards are met at 27.5°C. If new oxygen depleting discharges are proposed for Hunting Creek, the SOD should be re-evaluated as part of a TMDL assessment in order to more accurately determine appropriate permit limits. In the absence of any new discharges, however, a re-evaluation of the SOD in Hunting Creek should not be necessary.

In conclusion, the TPM results indicate that the following effluent limits are more than adequate to protect instream DO and eutrophication (as measured by chlorophyll-a):

Recommended Annual Permit Limits	
Parameter	Monthly Average (mg/L)
$CBOD_5$	5.0*
TSS	6.0*
TP	0.18*
NH_3 (Summer Only)	1.0*
DO	6.0

*Required by the Policy for the Potomac River Embayments.

Please do not hesitate to call with questions.

Yours very truly,

GREELEY AND HANSEN

Mark T. Kennedy

MTK/tlh
Attachments

H:\ADMIN\1853\300.01\HARVEY4.LTR

Nonpoint Sources: Includes summer 7Q10 of 2.5 cfs for Hunting Creek, and headwater constituent concentrations from the WLA Study.

Benthic Oxygen Demand: Taken from WLA Study and TPM Manual (page 29).

Turbidity (Light Extinction): Taken from the WLA Study and TPM Manual (page 29).

CBOD Decay: Taken from the WLA Study and TPM Manual (page 29).

Downstream Boundary Conditions: Taken from WLA Study, Alternative A2.

Biological Parameters: Taken from TPM Manual.

Presentation and Discussion of Model Results

The TPM predicts concentrations for water quality constituents at high tide for each model segment. The condition at low tide within each segment is approximated by translating the upstream segment concentration downstream one segment. Average concentration per segment over a tidal cycle is calculated as the arithmetic mean or average of these two values.

Four separate sets of DO results are presented in graphical and tabular form. A brief description of each is as follows:

Conditions in Set 1 have water temperature at 25 C with ASA DO effluent varying from 6.0 to 7.6 mg/l. Average conditions are substantially above the water quality standard of 5.0 mg/l in all segments under these scenarios, and differences attributed to varying the ASA effluent DO concentration are negligible.

Conditions in Set 2 have water temperature at 27.5 C with ASA DO effluent varying from 6.0 to 7.6 mg/l. Average conditions are above the water quality standard of 5.0 mg/l in all segments under these scenarios, and differences attributed to varying the ASA effluent DO concentration are negligible.

Conditions in Set 3 have water temperature increased to 29 C with ASA DO effluent varying from 6.0 to 7.6 mg/l. While average conditions remain above the water quality standard of 5.0 mg/l in all segments under these scenarios, excursions below the standard also occur. Again, differences attributable to varying the ASA effluent DO concentration are negligible.

Conditions in Set 4 have water temperature at 29 C, ASA DO effluent varying from 6.0 to 7.6 mg/l, and SOD reduced from 4.0 to 2.0 gm/m^2/day in segments 4, 5 and 6. As indicated, this change pulls the DO up substantially, even with temperature at 29 C.

Distance from Mouth (miles)	25 C 6.0 mg/l high tide	25 C 6.0 mg/l low tide	25 C 6.0 mg/l average
0.17	7.36	6.76	7.06
0.42	6.76	5.84	6.30
0.63	5.84	6.33	6.09
0.86	6.33	6.00	6.16
1.05	6.00	7.09	6.54
1.24	7.09	7.23	7.16
1.43	7.23	7.21	7.22
1.61	7.21	7.92	7.56
1.80	7.92	7.96	7.94
2.32	7.96	9.20	8.58

Distance from Mouth (miles)	25 C 6.5 mg/l high tide	25 C 6.5 mg/l low tide	25 C 6.5 mg/l average
0.17	7.38	6.84	7.11
0.42	6.84	5.86	6.35
0.63	5.86	6.34	6.10
0.86	6.34	6.06	6.20
1.05	6.06	7.12	6.59
1.24	7.12	7.25	7.19
1.43	7.25	7.23	7.24
1.61	7.23	7.92	7.58
1.80	7.92	7.96	7.94
2.32	7.96	9.20	8.58

Distance from Mouth (miles)	25 C 7.0 mg/l high tide	25 C 7.0 mg/l low tide	25 C 7.0 mg/l average
0.17	7.39	6.92	7.15
0.42	6.92	5.88	6.40
0.63	5.88	6.35	6.11
0.86	6.35	6.12	6.23
1.05	6.12	7.16	6.64
1.24	7.16	7.27	7.21
1.43	7.27	7.24	7.26
1.61	7.24	7.93	7.59
1.80	7.93	7.96	7.94
2.32	7.96	9.20	8.58

Distance from Mouth (miles)	25 C 7.6 mg/l high tide	25 C 7.6 mg/l low tide	25 C 7.6 mg/l average
0.17	7.40	7.02	7.21
0.42	7.02	5.90	6.46
0.63	5.90	6.36	6.13
0.86	6.36	6.19	6.28
1.05	6.19	7.20	6.70
1.24	7.20	7.29	7.25
1.43	7.29	7.26	7.28
1.61	7.26	7.94	7.60
1.80	7.94	7.96	7.95
2.32	7.96	9.20	8.58

Distance from Mouth (miles)	27.5 C 6.0 mg/l high tide	27.5 C 6.0 mg/l low tide	27.5 C 6.0 mg/l average
0.17	7.07	6.54	6.80
0.42	6.54	5.20	5.87
0.63	5.20	5.75	5.47
0.86	5.75	5.48	5.61
1.05	5.48	6.66	6.07
1.24	6.66	6.78	6.72
1.43	6.78	6.75	6.77
1.61	6.75	7.51	7.13
1.80	7.51	7.54	7.52
2.32	7.54	9.20	8.37

Distance from Mouth (miles)	27.5 C 6.5 mg/l high tide	27.5 C 6.5 mg/l low tide	27.5 C 6.5 mg/l average
0.17	7.08	6.62	6.85
0.42	6.62	5.22	5.92
0.63	5.22	5.75	5.49
0.86	5.75	5.53	5.64
1.05	5.53	6.69	6.11
1.24	6.69	6.80	6.74
1.43	6.80	6.76	6.78
1.61	6.76	7.52	7.14
1.80	7.52	7.54	7.53
2.32	7.54	9.20	8.37

Distance from Mouth (miles)	27.5 C 7.0 mg/l high tide	27.5 C 7.0 mg/l low tide	27.5 C 7.0 mg/l average
0.17	7.09	6.70	6.89
0.42	6.70	5.23	5.96
0.63	5.23	5.76	5.50
0.86	5.76	5.59	5.67
1.05	5.59	6.72	6.15
1.24	6.72	6.82	6.77
1.43	6.82	6.77	6.79
1.61	6.77	7.52	7.14
1.80	7.52	7.54	7.53
2.32	7.54	9.20	8.37

Distance from Mouth (miles)	27.5 C 7.6 mg/l high tide	27.5 C 7.6 mg/l low tide	27.5 C 7.6 mg/l average
0.17	7.10	6.79	6.95
0.42	6.79	5.25	6.02
0.63	5.25	5.77	5.51
0.86	5.77	5.65	5.71
1.05	5.65	6.76	6.21
1.24	6.76	6.84	6.80
1.43	6.84	6.78	6.81
1.61	6.78	7.53	7.16
1.80	7.53	7.54	7.53
2.32	7.54	9.20	8.37

Distance from Mouth (miles)	29 C 6.0 mg/l high tide	29 C 6.0 mg/l low tide	29 C 6.0 mg/l average
0.17	6.89	6.40	6.65
0.42	6.40	4.82	5.61
0.63	4.82	5.41	5.12
0.86	5.41	5.17	5.29
1.05	5.17	6.42	5.80
1.24	6.42	6.54	6.48
1.43	6.54	6.49	6.51
1.61	6.49	7.29	6.89
1.80	7.29	7.31	7.30
2.32	7.31	9.20	8.26

Distance from Mouth (miles)	29 C 6.5 mg/l high tide	29 C 6.5 mg/l low tide	29 C 6.5 mg/l average
0.17	6.90	6.48	6.69
0.42	6.48	4.84	5.66
0.63	4.84	5.42	5.13
0.86	5.42	5.23	5.32
1.05	5.23	6.45	5.84
1.24	6.45	6.55	6.50
1.43	6.55	6.50	6.53
1.61	6.50	7.30	6.90
1.80	7.30	7.31	7.31
2.32	7.31	9.20	8.26

Distance from Mouth (miles)	29 C 7.0 mg/l high tide	29 C 7.0 mg/l low tide	29 C 7.0 mg/l average
0.17	6.91	6.56	6.73
0.42	6.56	4.85	5.70
0.63	4.85	5.42	5.14
0.86	5.42	5.28	5.35
1.05	5.28	6.48	5.88
1.24	6.48	6.57	6.52
1.43	6.57	6.51	6.54
1.61	6.51	7.31	6.91
1.80	7.31	7.31	7.31
2.32	7.31	9.20	8.26

Distance from Mouth (miles)	29 C 7.6 mg/l high tide	29 C 7.6 mg/l low tide	29 C 7.6 mg/l average
0.17	6.92	6.65	6.79
0.42	6.65	4.87	5.76
0.63	4.87	5.43	5.15
0.86	5.43	5.34	5.38
1.05	5.34	6.51	5.92
1.24	6.51	6.59	6.55
1.43	6.59	6.52	6.55
1.61	6.52	7.31	6.92
1.80	7.31	7.31	7.31
2.32	7.31	9.20	8.26

(SOD<2.0 max) Distance from Mouth (miles)	29 C 6.0 mg/l high tide	29 C 6.0 mg/l low tide	29 C 6.0 mg/l average
0.17	6.97	6.47	6.72
0.42	6.47	6.24	6.36
0.63	6.24	6.55	6.39
0.86	6.55	6.28	6.42
1.05	6.28	6.43	6.35
1.24	6.43	6.54	6.48
1.43	6.54	6.49	6.52
1.61	6.49	7.30	6.89
1.80	7.30	7.31	7.30
2.32	7.31	7.10	7.21

(SOD<2.0 max) Distance from Mouth (miles)	29 C 6.5 mg/l high tide	29 C 6.5 mg/l low tide	29 C 6.5 mg/l average
0.17	6.98	6.55	6.76
0.42	6.55	6.25	6.40
0.63	6.25	6.56	6.40
0.86	6.56	6.33	6.45
1.05	6.33	6.45	6.39
1.24	6.45	6.56	6.51
1.43	6.56	6.50	6.53
1.61	6.50	7.30	6.90
1.80	7.30	7.31	7.31
2.32	7.31	7.10	7.21

(SOD<2.0 max) Distance from Mouth (miles)	29 C 7.0 mg/l high tide	29 C 7.0 mg/l low tide	29 C 7.0 mg/l average
0.17	6.99	6.63	6.81
0.42	6.63	6.27	6.45
0.63	6.27	6.56	6.42
0.86	6.56	6.39	6.47
1.05	6.39	6.48	6.43
1.24	6.48	6.57	6.53
1.43	6.57	6.51	6.54
1.61	6.51	7.31	6.91
1.80	7.31	7.31	7.31
2.32	7.31	7.10	7.21

(SOD<2.0 max) Distance from Mouth (miles)	29 C 7.6 mg/l high tide	29 C 7.6 mg/l low tide	29 C 7.6 mg/l average
0.17	7.00	6.72	6.86
0.42	6.72	6.29	6.50
0.63	6.29	6.57	6.43
0.86	6.57	6.45	6.51
1.05	6.45	6.52	6.48
1.24	6.52	6.59	6.55
1.43	6.59	6.52	6.56
1.61	6.52	7.31	6.92
1.80	7.31	7.31	7.31
2.32	7.31	7.10	7.21

Tidal Prism Model Inputs

```
70.
1.0        7.4
100.0
 99
999
0.2        0.005      .002       3.
0.2        .005       0.0
0.2         26.
.025       .005       .0005      .025       .005       .09        250.
632.       .005       0.2        1.00        1.00
0.6
.05
2.
□
```

TIDAL PRISM MODEL MANUAL

by
Barbara Diana, Albert Y. Kuo,
Bruce J. Neilson, Carl F. Cerco and Paul V. Hyer

Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

January 1987

ALEXANDRIA SANITATION AUTHORITY

Technical Memorandum
Hunting Creek Dilution Study for the Alexandria Sanitation Authority Wastewater Treatment Plant

Greeley and Hansen
June 1997

The volume of water within the embayment at high tide is approximately 46 million cubic feet, and the average depth is 4.6 feet (Diana et al., 1987). The freshwater inflow to the embayment is variable and linked directly to local rainfall. However, the majority of the water contribution to the embayment is tidal flow from the Potomac River. This can be seen from a disaggregation of embayment volumes as follows:

Tidal Cycle-based Water Volumes in Hunting Creek Embayment

Source of Water Contribution	Summer (April-October)	Winter (November-March)
Cameron Run (7Q10)[1]	112,500 cf (2.5 cfs)	234,000 cf (5.2 cfs)
ASA WWTP (Permitted Flow)	3,750,000 cf (54 MGD, 83.5 cfs)	3,760,000 cf (54 MGD, 83.5 cfs)
Tidal Flushing [2]	29,000,000 cf	29,000,000 cf
Total volume at low tide	16,750,000 cf	16,750,000 cf
Total volume at high tide	45,750,000 cf	45,750,000 cf

Note (1) From Herman, 1996.

(2) From Diana, et al., 1987. 29 million cubic feet per day nearly twice each day (tide cycle).

The large differences in volumes shown above indicate that the embayment is significantly influenced by tides.

The mouth of the embayment at its confluence with the Potomac River is broad and resembles a delta. Two channels drain out along the shoreline, one to the north and one to the south. The center of the embayment is a large expansive mud flat during low tide. Thick beds of Hydrilla and other submerged aquatic vegetation have occupied much of this outer embayment since 1984. As a Class II Estuarine Water (VR 680-21-01.5), the general water quality standards established by the Commonwealth of Virginia are intended to protect the embayment for recreational use and for the propagation and growth of a balanced population of fish and wildlife.

2.2 Description of the Virginia Institute of Marine Sciences (VIMS) Tidal Prism Model (TPM) for Hunting Creek Embayment

The Virginia Institute of Marine Science's (VIMS) Tidal Prism Model (TPM) was developed by VIMS and used to model water quality impacts in Hunting Creek Embayment. TPM development was supported by extensive field investigations, laboratory research, and model calibration and verification. TPM is endorsed by the Virginia Department of Environmental Quality as the preferred water quality modeling tool for the embayment.

The method to calculate the average effluent exposure of a drifting organism is to multiply the dilution factor in each segment by the time the organism is resident in that segment. The products of segment dilutions and exposure times are then added and the sum is divided by the cumulative exposure time for the organism -- held to four days for the purpose of chronic toxicity evaluations. Segment dilutions were determined using TPM. Drifting organism residence times in each segment were determined using DYNHYD.

3.1 TPM Results

TPM was run using upstream 7Q10 flows of 2.5 and 5.2 cfs (for summer and winter, respectively) and the ASA WWTP design flow of 54 MGD (83.5 cfs). The dilutions in each model segment in terms of percent effluent (or IWC) for these design conditions are as follows:

Dilution Rates from the VIMS Tidal Prism Model
for Hunting Creek Embayment
(Values as percent effluent or instream waste concentrations - IWC)

Model Segment	Summer 7Q10=2.5 cfs	Winter 7Q10=5.2 cfs
11 (upstream)	47.6%	23.8%
10	62.5%	47.6%
9	76.9%	71.4%
8	83.3%	76.9%
7	83.3%	83.3%
6	90.9%	83.3%
5	76.9%	71.4%
4	58.8%	55.6%
3	41.7%	41.7%
2 (downstream)	18.9%	18.9%

As expected, the dilution rates are greater in the winter months than in the summer months (i.e. the IWCs are smaller) in the upstream segments because of the greater winter 7Q10 flow. Tidal flushing controls dilution more significantly in the downstream segments, with segments 3 and 2 showing no seasonal differences in dilution under 7Q10 conditions.

Drifting Organism Exposure Results: Winter		
Upstream Starting Segment	Downstream Ending Segment	Cumulative Exposure (% effluent)
11	2	55.5% (worst case)
10	2	50.4%
9	2	49.6%
8	2	45.0%
7	2	43.7%
6	2	37.1%
5	Out of system (1)	33.4%
4	Out of system	31.4%
3	Out of system	27.2%
2	Out of system	22.1%

Notes (1) "Out of system" refers to a particle which would be flushed completely out of Hunting Creek Embayment into the main stem of the Potomac River.

The results show that the worst case (i.e. highest exposure) scenarios are for a drifting organism starting at model segments 9 (in the summer) and 11 (in the winter) which result in cumulative effluent exposure concentrations of 63.7% and 55.5% respectively. Several additional conclusions may be made as follows:

a. Drifting organisms will travel back and forth between the model segments according to tidal cycle.

b. It may take several tidal cycles to flush drifting organisms out of Hunting Creek Embayment into the Potomac River, depending on the starting point.

c. Drifting organisms beginning in segments 2 through 8 (the WWTP outfall is in segment 6) are flushed either into the Potomac River or segment 2, the outermost model segment adjacent to the Potomac River, in less than four days under summer critical flow conditions.

d. All drifting organisms in Hunting Creek are flushed either into the Potomac River or segment 2, the outermost model segment adjacent to the Potomac River, in less than four days under winter critical flow conditions.

is very low (say <0.5 mg/L) this is probably due to Potomac River inflow during an incoming tide. (It could also be due to stormwater flow if the STORET datum were taken during or just after a rainstorm). On average, however, one would expect to see a correlation between WWTP and GW Memorial Parkway Bridge ammonia data. Weekly WWTP effluent ammonia data and 57 monthly GW Memorial Parkway Bridge STORET ammonia data are shown in Table 1 (3 pages). These data, arranged side-by-side, show a general reduction in instream ammonia concentration, allowing for exceptional tide or weather events. The average ammonia reduction shown on Table 1 is 46% which confirms the presence of instream dilution and/or ammonia decay. Ammonia decay was not incorporated into this dilution study.

4.3 Hooffs Run WWTP Outfall

The outfall on Hooffs Run is in the same TPM model segment as outfall 001, therefore, model results for this outfall will be identical to the results for 001. This outfall is not used but may be placed in service during future construction activities.

5.0 REFERENCES

Diana, B., et al, "Tidal Prism Model," Virginia Institute of Marine Science, Gloucester Point, VA (1987).

Herman, Paul, "Flow Frequency Determination: Alexandria STP", Memorandum to April Young, Virginia Department of Environmental Quality, Richmond, VA, December 31, 1996.

U.S. Environmental Protection Agency (USEPA), "User's Manual for the Dynamic (Potomac) Estuary Model," NTIS PB-296-141, Annapolis, MD (1979).

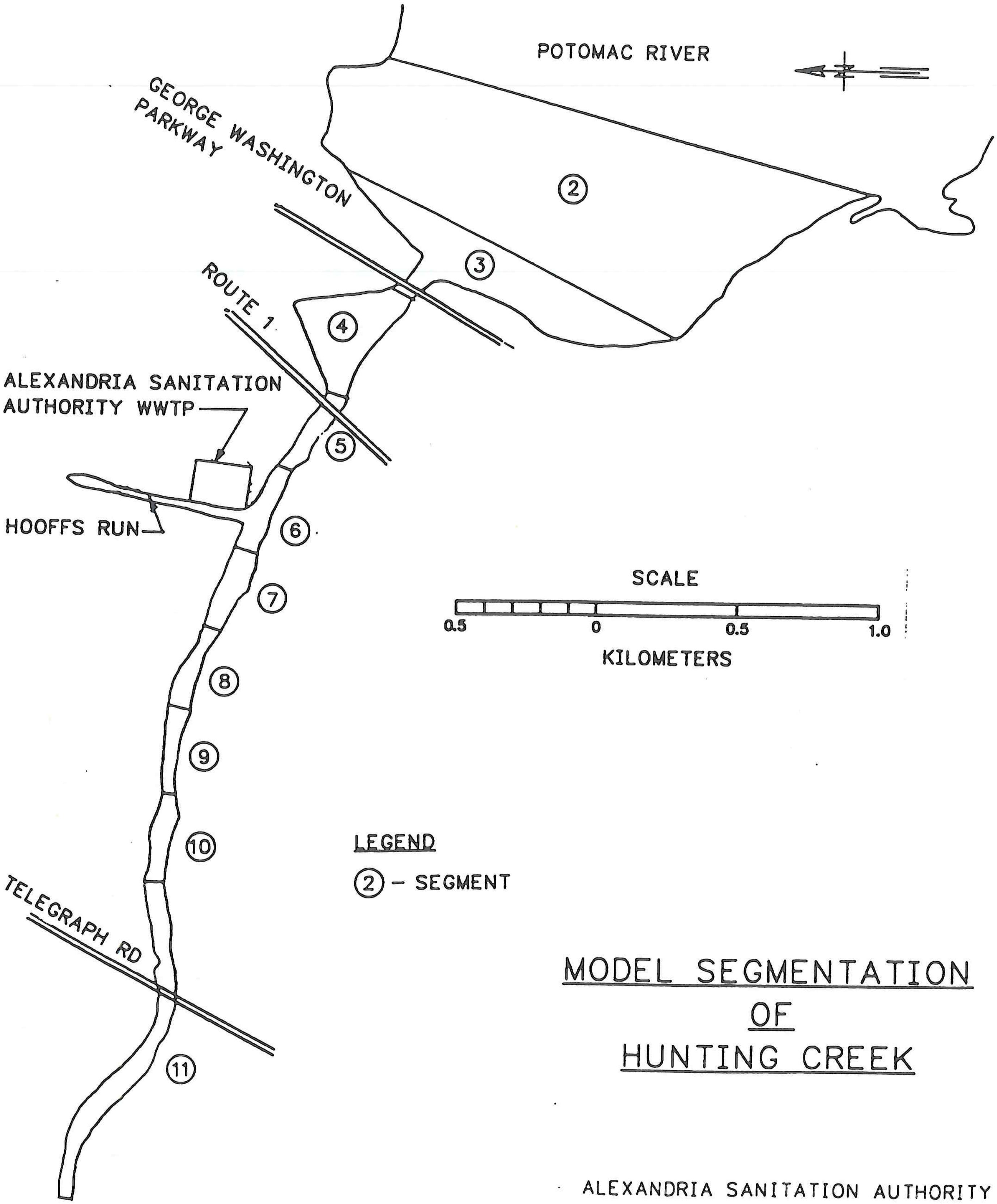
Virginia State Water Control Board, "Water Quality Standards", VR 680-21-00, Richmond, VA, May 20, 1992.

Water Resources Engineers (WRE), "A Water Quality Model of the Sacramento-San Joaquin Delta," Report to the U.S. Public Health Service, Region IX (1965).

TABLE 1
COMPARISON OF AMMONIA DATA FROM
ASA WWTP EFFLUENT AND THE STORET DATABASE
AT THE GEORGE WASHINGTON BRIDGE

DATE	Effluent Data NH3-N mg/L	STORET NH3 VALUES mg/L	Percent Reduction %
11-May-93		10.1	
12-May-93	16.8		39.9%
15-Jun-93		12.4	
16-Jun-93	20.2		38.6%
13-Jul-93		13.3	
14-Jul-93	17.5		24.0%
10-Aug-93		11.6	
11-Aug-93	19.0		38.9%
14-Sep-93		12.2	
15-Sep-93	22.4		45.5%
06-Oct-93	22.4		
07-Oct-93		9.8	56.2%
17-Nov-93	26.0	9	65.4%
07-Dec-93	13.2	4.1	68.9%
09-Feb-94	14.7	3.89	73.5%
02-Mar-94	12.9		
08-Mar-94		3.95	
10-Mar-94	9.4		64.7%
19-Apr-94		9	
20-Apr-94	16.8		46.4%
25-May-94	16.9	13.27	21.5%
14-Jun-94		4.65	
15-Jun-94	20.3		77.1%
16-Aug-94		11.1	
17-Aug-94	13.4		17.2%
13-Sep-94	26.0	19.6	24.6%
25-Oct-94		6.3	
26-Oct-94	22.4		71.9%
16-Nov-94	26.3	19.4	26.2%
13-Dec-94		14.24	
14-Dec-94	23.0		38.1%
18-Jan-95	20.8	0.63	97.0%
07-Feb-95	11.8	16.75	-41.9%

FIGURE 1



MODEL SEGMENTATION OF HUNTING CREEK

ALEXANDRIA SANITATION AUTHORITY
HUNTING CREEK DILUTION STUDY
FINAL REPORT
JUNE, 1997

GREELEY AND HANSEN

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COUNCIL OF GOVERNMENTS
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(202) 223-6800 TDD 223-5980

A DISSOLVED OXYGEN STUDY OF THE UPPER POTOMAC ESTUARY

FINAL REPORT

EXECUTIVE SUMMARY

Prepared By

Wendy H. Chittenden and Stuart A. Freudberg

Department of Environmental Programs
Metropolitan Washington Council of Governments

On Behalf of the
Potomac Studies Policy Committee

December, 1987

10.3 ALTERNATIVE TREATMENT SCENARIOS

DEM simulations were made for the following scenarios. Again, all simulations were run under two different conditions: 1) extreme low flow conditions (Q7-10, 28°C); and 2) typical summer conditions characterized by a below median summer flow of 2500 cfs and a median summer temperature of 23°C.

10.3.1 Existing Treatment, Projected 2005 Flows

These simulations assumed wastewater effluent concentrations at the BPFS recommended levels in the year 2005, with 2005 design flows at the plants. Effluent concentrations used in the model are outlined in Table 10.2. These runs were used to produce baseline assessments of predicted minimum dissolved oxygen levels under the two different flow conditions to which all other alternatives were compared.

Table 10.2
Flows and Concentrations Assumed for the
Projected 2005 Alternatives

	FLOW (MGD)	BOD5 (mg/l)	NH3* (mg/l)	DO (mg/l)
Blue Plains	370	5.0	1.1	5.0
Arlington**	32	10.0	15.2	5.0
Alexandria	49	10.0	15.2	5.0

* NH3 plus 10% TON
** Simulations were also made assuming a 2005 Arlington flow of 40 MGD.

10.3.2 Nitrification at Arlington and Alexandria

These runs were used to simulate the nitrification requirement originally recommended by the regulatory agencies. They assumed flows and effluent concentrations identical to those outlined in Table 10.2 for all parameters except ammonia. As a result of nitrification, available ammonia at Arlington and Alexandria was reduced to 0.38 mg/l, consistent with a TKN of 1.99 mg/l.

10.3.3 Nitrification Alternatives at Blue Plains

Currently, the Blue Plains effluent limit for unoxidized nitrogen is 1.0 mg/l of ammonia. For DEM modeling purposes, it is assumed that this limit results in 1.1 mg/l of total available ammonia (available ammonia=ammonia+0.1 TON). An alternative discharge limit for regulating nitrification at that plant would be 1.99 mg/l of TKN. Under this scenario, the available ammonia concentration is assumed to be 0.38 mg/l (0.2 + (.10)(1.79)). (As discussed in Section 2, actual ammonia effluent concentrations at Blue Plains are usually much less than 1.0 mg/l). DEM was use to compare this alternative with the current 1.0 mg/l ammonia limit situation.

Table 10.3
Results of Alternative Treatment Scenario DEM Runs

Treatment Alternative	Q7-10 Conditions: Min. Daily Average DO mg/l	Q7-10 Conditions: DO Change From Base Case, mg/l	Typical Summer Conditions: Min. Daily Average DO mg/l	Typical Summer Conditions: DO Change From Base Case, mg/l
Existing Treatment (Base Case)	6.31	-	7.24	-
Nitrification at Both Arlington & Alexandria				
- 32 MGD Arl., 49 MGD Alex.	6.80	0.49	7.39	0.15
- 40 MGD Arl., 49 MGD Alex.	6.78	0.47	7.38	0.14
Nitrification Alexandria Only	6.47	0.16	7.27	0.03
Nitrification Arlington Only (Assumes 32 MGD)	6.58	0.27	7.37	0.13
1.99 mg/l TKN Limit at Blue Plains	6.42	0.11	7.26	0.02
Effluent Aeration to Saturation at Arlington Alexandria & Blue Plains	6.60	0.29	7.42	0.18
Reduction in Upstream Loads				
- 12% Reduction	6.39	0.08	7.36	0.12
- 36% Reduction	6.59	0.28	7.66	0.42
40% Reduction in Upstream Loads Assuming Current WWTP Concentrations of TSS and BOD	6.79	0.48	7.85	0.61

As the results indicate the implementation of nitrification at Arlington and Alexandria can be expected to increase dissolved oxygen levels by at most 0.15 mg/l under typical summer conditions, and 0.48 mg/l under critical summer conditions. For the Q7-10 case, however, it should be recalled that based on the Monte Carlo analysis described in Section 9, the maximum incremental gain in dissolved oxygen concentrations resulting from nitrification represents an upper bound limit and, due to algal concentrations and productivity rates, may not be achieved at all times under the expected range of environmental conditions.

As expected, DEM runs assuming nitrification at either Alexandria or Arlington, alone, produced a much smaller DO benefits. Nitrification at Arlington resulted in an estimated benefit of 0.13 mg/l under typical summer conditions, and 0.27 mg/l at Q7-10. Nitrifying at Alexandria only produced an estimated benefit of 0.03 mg/l under typical conditions and 0.16 mg/l under Q7-10.

10/8/2008 2:56:43 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Ammonia (April - October)
Chronic averaging period = 30
WLAa = 52
WLAc = 5.6
Q.L. = .2
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 11.2989525231313
Average Weekly limit = 6.90035173462532
Average Monthly LImit = 5.63358052915256

The data are:

9

10/8/2008 2:55:06 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Ammonia (November - January)
Chronic averaging period = 30
WLAa = 66
WLAc = 11
Q.L. = .2
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

10/8/2008 2:56:06 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Ammonia (February - March)
Chronic averaging period = 30
WLAa = 66
WLAc = 6.9
Q.L. = .2
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 13.9219236445725
Average Weekly limit = 8.50221910159191
Average Monthly LImit = 6.94137600913441

The data are:

9

10/8/2008 4:18:54 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Chlorine
Chronic averaging period = 4
WLAa = 38
WLAc = 12
Q.L. = .1
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 20
Variance = 144
C.V. = 0.6
97th percentile daily values = 48.6683
97th percentile 4 day average = 33.2758
97th percentile 30 day average= 24.1210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 17.5508974086388
Average Weekly limit = 10.7184595324212
Average Monthly LImit = 8.75075753332398

The data are:

20

10/8/2008 2:58:33 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Cadmium
Chronic averaging period = 4
WLAa = 9.8
WLAc = 1.4
Q.L. = 0.5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 9
Expected Value = .303930
Variance = .033254
C.V. = 0.6
97th percentile daily values = .739588
97th percentile 4 day average = .505675
97th percentile 30 day average= .366555
< Q.L. = 8
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

1
0
0
0
0
0
0
0
0

10/8/2008 2:59:25 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Chromium
Chronic averaging period = 4
WLAa = 32
WLAc = 12
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 2.42
Variance = 2.10830
C.V. = 0.6
97th percentile daily values = 5.88887
97th percentile 4 day average = 4.02637
97th percentile 30 day average= 2.91864
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

4.2
2.8
3.1
1
1

10/8/2008 3:19:06 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Copper
Chronic averaging period = 4
WLAa = 32
WLAc = 12
Q.L. = 2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = 3.39026
Variance = 4.13780
C.V. = 0.6
97th percentile daily values = 8.24993
97th percentile 4 day average = 5.64069
97th percentile 30 day average= 4.08884
< Q.L. = 2
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

5.7
4.3
4.1
3.4
5
54
0
0

10/8/2008 3:20:07 PM

Facility = City of Alexandria Sanitation Authority
Chemical = Zinc
Chronic averaging period = 4
WLAa = 280
WLAc = 154
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = 67.325
Variance = 1631.75
C.V. = 0.6
97th percentile daily values = 163.829
97th percentile 4 day average = 112.014
97th percentile 30 day average= 81.1975
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

53.8
49.8
50
56
42
40
40
207

Nutrient Removal Capacity of the ASA AWTF after Interim Optimization Upgrade

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DATE:	~~December 19, 2008~~ REVISED March 5, 2009

Executive Summary

This technical memorandum describes the nitrogen removal capacity of the Alexandria Sanitation Authority's (ASA) Advanced Wastewater Treatment Facility (AWTF) after completion of the Interim Optimization Project, (referred to as Contract 1A or C1A).

In 2003 the AWTF completed an upgrade to achieve a biological nitrogen removal (BNR) annual goal of 8 mg/L total nitrogen (TN). In 2006, ASA submitted an interim optimization project (IOP) the goal of which was to optimize nitrogen removal in the BNR treatment processes at average 2003/2004 (current) flows, loads and operating conditions.

The IOP evaluation predicted that, with the C1A improvements, the AWTF could meet the Total Nitrogen (TN) annual waste load allocation (WLA) at the 2003/2004 average flows and pollutant loads. However, that treatment capacity prediction is not considered a design capacity assessment as it did not take into account appropriate design peaking factors for flows and loads. Nor did the evaluation consider necessary activities that might require taking process units out of service and/or operation in alternate process configurations such as MLE. The design factors will be addressed under the ENR treatment upgrade starting design in 2009 which will provide new treatment facilities to upgrade the AWTF to meet State of the Art (SOA) nitrogen limits at design 54 mgd conditions.

Therefore, it is CH2M HILL's best engineering assessment that the AWTF with C1A installed can reliably meet a calendar year TN concentration limit of 6 mg/L at all flows and loads up to the 54 MGD design conditions.

ASA has committed to optimizing nitrogen removal and will continue to strive to produce a high-quality final effluent and optimize nutrient removal at all flows and loads consistent with its Board approved strategic plan, its environmental management system, and its membership in the Virginia Environmental Excellence Program (VEEP) as an Exemplary Environmental Enterprise (E3).

Background

ASA has undertaken a multi-phased upgrade approach to meet its waste load allocation (WLA) for total nitrogen (TN):

BNR Upgrade Project

The design of the first nitrogen upgrade project began in 1997, with construction starting in 1999 and ending in 2005. The installed treatment process achieves the voluntary 1999 WQIF grant agreement goal of 8 mg/L TN on an annual average basis and the VPDES effluent Total Phosphorous (TP) concentration limit of 0.18 mg/L on a monthly average basis at the design flow of 54 MGD. The nitrogen removal process was started up in December 2002 and has been achieving the desired level of treatment. This first project was undertaken to satisfy earlier Chesapeake Bay Agreements.

Chesapeake 2000 Agreement

In response to the Chesapeake 2000 Agreement, the Virginia State Water Control Board (SWCB) approved regulations in 2006 to further reduce the TN and TP discharged from wastewater treatment facilities. The revised regulations require the ASA facility to meet waste load allocations for TN and TP beginning in January 2011 in accordance with the schedule required by the General Permit. The WLA for TN is 493,381 lb TN/yr and it is based on achieving a final effluent concentration of 3 mg/L TN on an annual average basis at the design flow of 54 MGD. In 2006, ASA submitted to DEQ a Basis of Design Report to Achieve Enhanced Nitrogen Removal at the Alexandria AWTF. This study evaluated the capacity of ASA's existing facility to comply with the new WLA limits. The study concluded that the existing phosphorus removal process at the ASA AWTF is adequate, however additional nitrogen control projects will be required to meet the regulatory requirements at the design flows and loads. The report included recommendations for optimization of the existing system and an evaluation of alternatives for process upgrades.

Interim Optimization Project (IOP) at Current Flows and Loads

The goal of the interim optimization project (Contract 1A, or C1A) was to optimize the nitrogen removal capacity of the existing treatment processes at current flows, loads and operating conditions. Table 1 summarizes the annual average flows and loads that were used in the IOP when evaluating the treatment capacity of the facility after C1A was completed. The evaluation concluded that, with the C1A improvements, the AWTF can meet the annual waste load allocation (WLA) consisting of 493,381 lb TN/yr at the average flows and pollutant loads shown on Table 1. The evaluation was based on average flows and loads from 2003 and 2004 and did not take into account construction activities that might require taking process units out of service or alternate operation modes. The evaluation used historical peaking factors based on plant influent data through 2004. Because the steady increase in influent loadings experienced by the plant has continued since 2004, the peaking factors used in the IOP evaluation do not accurately reflect the variability in plant loadings that the plant is currently experiencing.

TABLE 1
Annual Average Raw Wastewater Flows and Mass Loads (2003-2004)

Parameter	Units	Annual Average
Influent Flow to the Plant	MGD	40
5-day Biochemical Oxygen Demand (BOD_5)	lb/day	54,300
Total Suspended Solids (TSS)	lb/day	74,700
Total Kjeldhal Nitrogen (TKN)	lb-N/day	9,900
Total Phosphorus (TP)	lb-P/day	1,900

The C1A project modifications provide improved operation of the five existing biological reactor basins (BRBs) in step-feed mode with a post-anoxic zone. The post-anoxic zone was created by installing membrane diffusers and submersible mixers to the last two existing biological reactor basins (BRBs). The amount of methanol that can be fed to the post-anoxic zone was increased by combining the discharge piping of the existing chemical dosing pumps. The modifications also included replacing all ceramic diffusers with membranes to maximize nitrogen removal flexibility; scum removal enhancements to minimize the negative impacts of *Nocardia* scum (which have hampered the plant since its upgrade) and dewatering centrate handling improvements to help flow pace and better manage this high nitrogen source. The contract for these modifications was awarded for $2.1M and the project is completed and pending issuance of a certificate to operate (CTO). The interim optimization upgrade was a very cost effective and sound interim measure for optimizing TN removal quickly.

State of the Art (SOA) Nitrogen Removal Upgrade

Additional nitrogen removal upgrades are needed to assure TN WLA and concentration compliance at 54 MGD design flow and loads. In 2008 ASA and CH2M HILL conducted a long-range planning and alternatives evaluation process to develop a strategy for compliance with the new nutrient limits at the design annual average flow of 54 MGD. The results from this process are documented on the Basis of Design to Achieve State-of-the-Art Nutrient Removal Report dated October 2008. ASA will begin design of these upgrades in 2009 now that C1A has been completed and there is some operational history with the C1A modifications. Construction will be phased to introduce new treatment facilities as needed to meet WLA's and concentration limits and also to treat the increasing influent flows and loads to the plant. The phased approach is cost effective and fiscally responsible. Phasing will provide the opportunity to consider new information to make best use of the existing facilities and to minimize impacts to existing unit processes which might have to be removed to make room for technologies to meet the new, lower TN limit.

Design Conditions for SOA Nutrient Removal Upgrade

Design Flows and Mass Loads

A Wastewater Flows and Loads Study (included in Appendix A) was conducted in order to assess the future flows and loads that would have to be treated at the plant. This study evaluated the historical plant flows from 1992 to the present, determined the historical annual averages, maximum month, maximum day and instantaneous peaking factors and projected these flows into the future. The future predictions used calculated per-capita flows based on historical flow and population data and projected the flow increases likely to occur as a result of population growth in the service area. Table 2 summarizes the annual average flows and loads used as the basis of design.

TABLE 2
Design Raw Wastewater Flows and Mass Loads

Parameter	Units	Annual Average
Influent Flow to the Plant	MGD	54
5-day Biochemical Oxygen Demand (BOD_5)	lb/day	84,600
Total Suspended Solids (TSS)	lb/day	110,000
Total Kjeldhal Nitrogen (TKN)	lb-N/day	15,800
Total Phosphorus (TP)	lb-P/day	2,600

The Wastewater Flows and Loads Study used flow equations and population data provided by the City of Alexandria and Fairfax County in 2007 to determine the projected service population and flows to the plant. The resulting projected per capita flow to the plant for both jurisdictions combined is about 120 gpd which includes domestic and commercial flows plus infiltration and inflow (I&I). This value is within the normal range of historical averages for areas with combined sewers as defined by the US EPA[1]. This data has been used by the City of Alexandria and by ASA in projecting the flows to the plant, most recently in the Wet Weather Flow Model Update and RDII Estimation Report dated October 2007.

Table 2 summarizes the raw influent wastewater mass loadings that are being used for the basis of design for this upgrade. The design mass loadings were calculated as part of the Wastewater Flows and Loads study (included in Appendix A). The study evaluated historical mass loadings coming into the plant between the years 2000 and 2007 and determined the historical annual averages, maximum month, maximum week and maximum day peaking factors. Per capita mass loadings were established by dividing the average annual mass loadings by the historical population data. The projected annual average mass loadings at the design condition (54 MGD annual average flow) were calculated by multiplying the historical per capita mass loadings by the predicted population at the design condition – 54 MGD divided by 120 gpd per capita results in an equivalent population of around 450,000.

Design Criteria

Table 3 presents the design criteria assumed for the evaluation in considering the nitrogen removal capability. This design criteria was used in developing the process model that predicted the process performance for various scenarios.

[1] Federal Register (1989) 40 CFR Part 133 and 40 CFR Part 35.2005 (b)(16)

TABLE-3
Design Criteria For Nitrogen Removal

Parameter	Units	Annual Average	Max. Month
Primary Treatment TSS removal without chemical addition	%	60%	60%
Primary Treatment TSS removal with chemical addition	%	85%	80%
Temperature	^{o}C / ^{o}F	20 / 68	14 / 57
Maximum Solids Loading Rate to Secondary Settling Tanks (6 units in service)	lbs/day-sq ft	26	26
Minimum Nitrification Solids Retention Time (SRT) Process Design Factor	-	2.0	2.0

Process Modeling

The existing ASA facility was modeled using CH2M HILL's proprietary whole-wastewater treatment plant simulation software entitled Professional Process Design (Pro2D™). Pro2D™ is a steady-state simulator that maintains a full-plant mass balance and for biological treatment uses a peer-reviewed model based on a series of continuous flow-stirred tank reactors. The model uses methanol as the carbon source and it simulates a separate methanol-degrading biomass to determine the denitrification rate of the system. The kinetic parameters of this biomass were adjusted to reflect site-specific characteristics.

To enhance the representation of the ASA system, model inputs were customized using the data collected during a wastewater characterization program carried in the winter and in the summer of 2008 to determine the nature of the raw influent flow to the plant and to capture any seasonal variations. The results of this study are included in Appendix B.

Conclusions

The goal of the interim optimization project was to enhance the existing treatment processes to optimize nitrogen removal at current flows, loads and operating conditions. With the C1A improvements, the AWTF can meet the Total Nitrogen (TN) annual waste load allocation (WLA) consisting of 493,381 lb TN/yr at the current average flows and pollutant loads. The evaluation was based on average flows and loads and did not take into account construction activities that might require taking process units out of service or alternate operation modes.

The existing system at ASA can be expected to reliably meet a total nitrogen limit of 6 mg/L year-round at the design annual average flows up to 54 MGD and corresponding influent loadings. The nitrogen removal capacity of the system is mainly limited by the solids loading rate to the secondary settling tanks and by the ability to feed the supplemental carbon source, such as methanol, to the system.

As part of the next facility upgrade, ASA will increase the supplemental carbon storage and pumping capacity of their existing system. In addition, the selected strategy for compliance with the new permit limits will include additional reactor volume, a nutrient management facility to reduce the diurnal peak loadings to the system and a dewatering centrate treatment facility to reduce the ammonia recycled to the system. These strategies combined will allow ASA to meet the Waste Load Allocation at the design annual average flow of 54 MGD.

Appendix A
Wastewater Flows and Loads

Wastewater Characterization Study Report TM#1: Flow and Load Projection to Design Conditions

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DATE: May 20, 2008

Objectives

The goal of this technical memorandum (TM) is to document historical flows and loads to the Alexandria Sanitation Authority (ASA) wastewater treatment plant (WWTP) and to project flows and loads forward to year 2030 and to the design point of 54 MGD. To do this, population projections have been developed and per capita flow and loading data have been applied to estimate average flows and loads in the future. Historical data has been used to develop flow and load peaking factors which have then been applied to projected average daily values to estimate flows and loads under maximum month, maximum week, and maximum day conditions. These values are intended to be used in subsequent wastewater characterization and refinement of the process modeling to be performed upon completion of the proposed wastewater sampling program.

Source of Data

CH2M HILL completed a Wet Weather Flow Study of the influent flows to the collection system in July 2007 (Task Order 4-2005 Technical Memorandum – Wet Weather Flow Model Update and RDII Estimation, October 2007). As part of the study projected flow and population data from the City of Alexandria and from Fairfax County were compiled. The projections presented in this TM build on these same data.

City of Alexandria

ASA serves the City of Alexandria and portions of Fairfax County. The Authority has a service agreement with the County whereby the plant reserves 60% of its capacity for Fairfax County flows. Fairfax County pays ASA a fee based on the actual MGD received.

As part of the Wet Weather Flow Study, the City of Alexandria provided data from the Metropolitan Washington Council of Governments (MWCOG) which runs a cooperative forecasting program to develop region-wide forecasts of employment, households, and population. The City used data generated in the MWCOG 2005 Round 7 Estimate to calculate projected future flows to the plant based on the following equation:

Flow = 180 gpd per Household + 20 gpd per Total Employment (jobs)

The data received from the City had been adjusted to account for areas that are not served by ASA (a small portion of the City is served by the Arlington County wastewater treatment plant). Since the difference between the corrected data and the total data is very small (less than 1%), the total City of Alexandria projected household, employment and population data as provided in the MWCOG report of 2006, were used for the purposes of this study.

The data in the MWCOG report comprises the years 1990, 2000, 2005, 2010, 2015, 2020, 2025, and 2030. This data was plotted on a chart and extrapolated to obtain estimated household, employment and population data in the City of Alexandria for all the years in-between.

Fairfax County

During the Wet Weather Flow Study, Fairfax County used numbers from their planning department to estimate future flows to ASA. Using this data, which includes year-by-year historical data (1990 to 2007) and forecast data (2008 to 2030) for population connected to ASA's plant, flow and load projections were developed for contributions from the County.

Fairfax County uses an equation to calculate future flow (2008 and beyond) based on population. The equation is as follows:

Flow (MGD) = [85 GPD/capita × Population + 0.86 GPD/capita per inch of rain × Population × average rainfall]/1,000,000 + 1.05 MGD

The equation assumes an average annual rainfall of 45 inches for 2008 through 2030.

The 1.05 MGD added is for the City of Falls Church (County assumes a constant flow from this source in the future)

Since the only variable in this equation is the population, this results in a net equation:

Flow (MGD) = (123.6 GPD/capita × Population) /1,000,000 + 1.05 MGD

Projected Annual Average Flows

The data and equations identified above were used to project future wastewater flows from the City of Alexandria and Fairfax County (Table 1). The estimated annual average daily flow for year 2030 is 42.8 MGD for a service population of 357,500. The calculated average flow per capita is 120 gpd, which translates into a final service population of approximately 450,000 people at the design average flow of 54 MGD.

It should be noted that the Wet Weather Flow Study TM projected a 2030 average daily flow value of 44.9 mgd (see Table 11 on Page 37 of the TM). On page 36 of the TM, it states that

> the 2005 estimates from both the County and City were compared to the 2007 flow measurements. In all cases, the measured flow was higher than the 2005 estimates. This is likely

a result of several variables, including groundwater infiltration or inaccuracies in unit flow estimates. The future flow projections were, therefore, adjusted up by the increment between the 2005 estimated flow and the 2007 measured flows.

Therefore, in order to maintain consistency with the results of the Wet Weather Flow Study, 44.9 mgd will be used as the projected 2030 annual average flow.

The historical flow data was obtained from ASA's plant records (OP10 and LOIS databases). The raw influent flow used was as calculated by the plant to subtract internal recycles and used for billing.

Figure 1 shows the actual and projected wastewater flows.

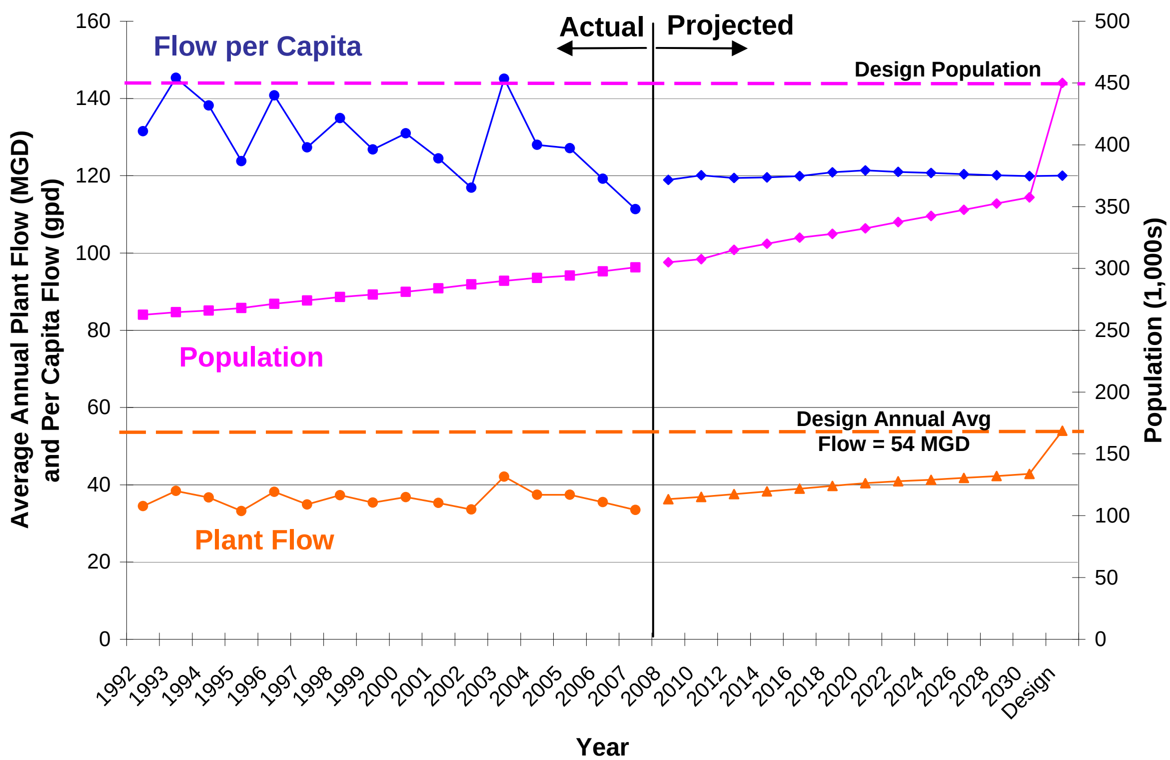

FIGURE 1.
Actual and Projected Wastewater Flows.

TABLE 1
Historical Flows and Future Flow Projection

Year	Population	Flow[a] (mgd)	Flow per Capita[b]
1992	262,583	34.5	131.5
1993	264,615	38.4	145.3
1994	265,914	36.7	138.2
1995	267,922	33.2	123.8
1996	271,385	38.2	140.8
1997	274,207	34.9	127.3
1998	276,814	37.3	134.9
1999	278,841	35.4	126.8
2000	281,172	36.8	131.0
2001	283,904	35.3	124.5
2002	287,121	33.6	116.9
2003	290,008	42.1	145.1
2004	292,374	37.4	128.0
2005	294,164	37.4	127.1
2006	297,610	35.5	119.2
2007	300,818	33.5	111.4
2008	305,000	36.3	118.9
2010	307,500	36.9	120.1
2012	315,000	37.6	119.4
2014	320,000	38.3	119.6
2016	325,000	39.0	119.9
2018	328,000	39.7	120.9
2020	332,500	40.4	121.4
2022	337,500	40.9	121.0
2024	342,500	41.3	120.7
2026	347,500	41.8	120.4
2028	352,500	42.3	120.1
2030	357,500	42.8[c]	119.9
Design	450,000	54	120

[a] Actual, 1992 to 2007; projected, 2008 to 2030 per Fairfax County and City of Alexandria Projections
[b] Calculated. Units: Gallons per capita per day
[c] Value is prior to 2.1 mgd adjustment, per Wet Weather Flow Study TM.

Projected Annual Average Loads

Loadings to the ASA wastewater treatment plant have been quite variable throughout the years for which data is available (1992 to 2007). The general trend has been an increase in loadings to the plant, although a leveling off in recent years has been observed. Figure 2 shows the historical trend in annual average mass loadings of TSS and BOD from 1992 to 2007. This figure also shows the average annual flows to the plant and the total annual precipitation (rainfall and snow).

Per capita loading values for the various parameters were calculated by dividing the annual average loadings by the corresponding service population. For TSS and BOD loadings, data was used from years 2000 through 2007 since this reflects a period after automatic composite sampling was started. For TKN, ammonia, and TP loadings the period 2003 through 2007 were used since daily, as opposed to only weekly, concentration data was collected beginning in 2003.

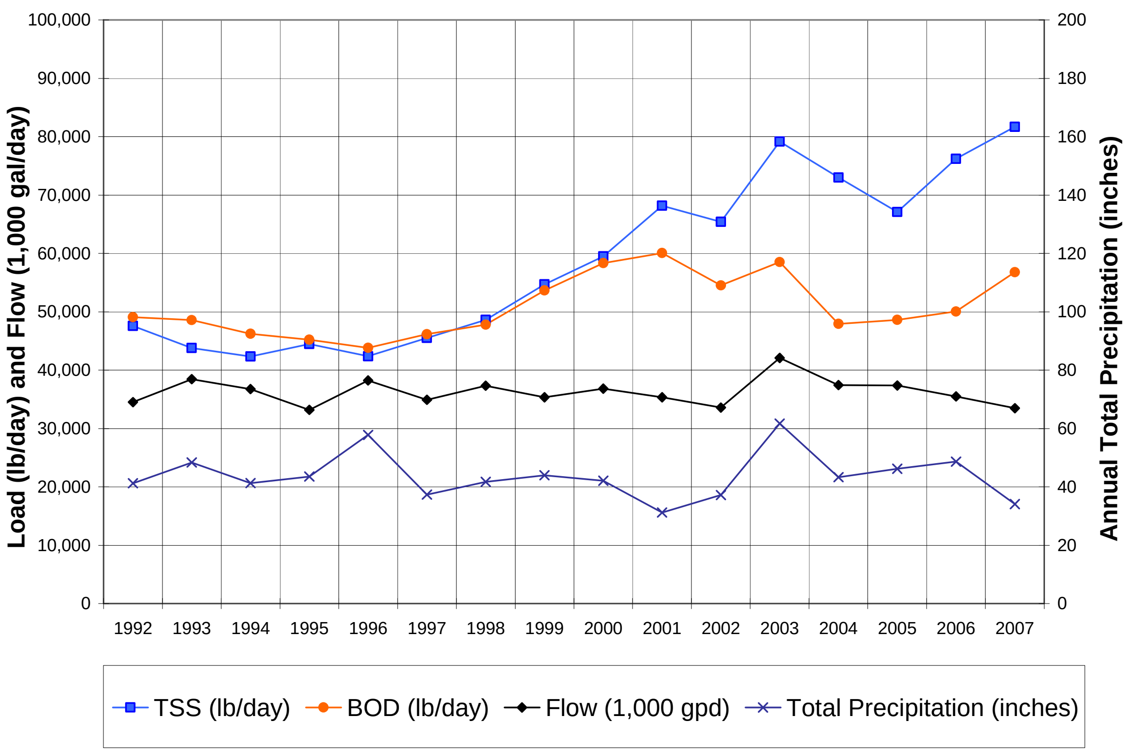

FIGURE 2
Annual Average TSS and BOD Mass Loadings.

The resulting average per capita values were compared against those found in literature. The projected future loads were then developed by multiplying the average per capita values times the future projected population. This information is summarized in Table 2.

TABLE 2
Future Load Projection

Year	Population	Flow, Actual or Calculated (mgd)	Per Capita Nutrient Loads (lbs/day per capita)						Flow per Capita, Calculated (gpcd)
			TSS	CBOD5-T	TKN	NH3	TP	PO4	
2000	281,172	36.8	0.21	0.21	—	—	—	—	131.0
2001	283,904	35.3	0.24	0.21	—	—	—	—	124.5
2002	287,121	33.6	0.23	0.19	—	—	—	—	116.9
2003	290,008	42.1	0.27	0.20	0.038	0.021	0.007	0.002	145.1
2004	292,374	37.4	0.25	0.17	0.030	0.016	0.006	0.001	128.0
2005	294,164	37.4	0.23	0.17	0.031	0.018	0.005	0.002	127.1
2006	297,610	35.5	0.26	0.17	0.034	0.021	0.006	0.002	119.2
2007	300,818	33.5	0.27	0.19	0.035	0.022	0.006	0.002	111.4
Average			0.24	0.19	0.034	0.019	0.006	0.002	126
Literature Value[a]			0.25	0.22	0.029	0.019	0.008	0.003	—
2008	305,000	36.3	74,362	57,350	10,682	6,190	1,767	510	118.9
2010	307,500	36.9	74,971	57,820	10,769	6,241	1,781	514	120.1
2012	315,000	37.6	76,800	59,231	11,032	6,393	1,825	527	119.4
2014	320,000	38.3	78,019	60,171	11,207	6,494	1,854	535	119.6
2016	325,000	39.0	79,238	61,111	11,382	6,596	1,883	543	119.9
2018	328,000	39.7	79,969	61,675	11,487	6,657	1,900	548	120.9
2020	332,500	40.4	81,067	62,521	11,645	6,748	1,926	556	121.4
2022	337,500	40.9	82,286	63,461	11,820	6,849	1,955	564	121.0
2024	342,500	41.3	83,505	64,402	11,995	6,951	1,984	573	120.7
2026	347,500	41.8	84,724	65,342	12,170	7,052	2,013	581	120.4
2028	352,500	42.3	85,943	66,282	12,345	7,154	2,042	589	120.1
2030	357,500	42.8[b]	87,162	67,222	12,520	7,255	2,071	598	119.9
Design	450,000	54	109,714	84,615	15,760	9,133	2,607	752	120

[a] *Wastewater Engineering—Treatment, Disposal, Reuse*. Metcalf & Eddy, Third Edition, 1991.
[b] Plus 2.1 mgd adjustment per Wet Weather Flow Study TM.

Peaking Factor Development and Projected Flows

Historical data was analyzed to determine the peaking factors that have been observed in the past for flows and loads. Because the flow peaking factors and the load peaking factors do not usually occur at the same time, the analysis looked at them separately.

Flow Peaking Factors

Maximum month, week, and day flow peaking factors (PF) are estimated in Table 3 based on historical raw influent plant flow data. The term "peak hydraulic flow" refers to the highest instantaneous flow measurement recorded by the plant's influent flow meter.

TABLE 3
Historical Flow Peaking Factors

Year	Actual Avg. (mgd)	Calculated Avg.[a] (mgd)	Actual Max. Month (mgd)	Max. Month PF	Actual Max Week (mgd)	Max. Week PF	Actual Max. Day (mgd)	Max. Day PF	Actual Peak Hyd. (MGD)	Peak Hyd. PF
2000	36.83	33.74	45.26	1.34	52.12	1.54	70.08	2.08	102	3.02
2001	35.33	34.07	42.00	1.23	45.07	1.32	70.53	2.07	98	2.88
2002	33.58	34.45	39.07	1.13	48.31	1.40	73.52	2.13	—	—
2003	42.08	34.80	53.84	1.55	66.69	1.92	96.32	2.77	133.5	3.84
2004	37.43	35.08	46.92	1.34	54.35	1.55	78.02	2.22	123.4	3.52
2005	37.38	35.30	46.91	1.33	60.60	1.72	97.61	2.77	128.7	3.65
2006	35.48	35.71	45.12	1.26	66.22	1.85	103.84	2.91	125.0	3.50
2007	33.49	36.10	43.67	1.21	51.14	1.42	84.70	2.35	114.4	3.17
Avg.	**36.45**	**34.91**	**45.35**	**1.30**	—	**1.59**	—	**2.41**	—	**3.53[b]**
Max.	—	—	—	**1.55**	—	**1.92**	—	**2.91**	**133.5**	**3.84**

[a] Based on applying 120 gpcd flow to the annual population.
b Averages for period of 2003-2007, after plant upgrade completed and hydraulic bottlenecks reduced

The methodology used to develop the peaking factors in Table 3 is based on the assumption that "actual" annual average flows contain a variable base flow amount which is affected by whether the system is experiencing a "dry," "wet," or "typical" year. This can be seen by comparing the columns for "Actual Average" (which are direct system measurements) and "Calculated Average" which is derived by multiplying the system population by the design per capita flow rate of 120 gpcd. The data presented in Tables 1 and 2 show, for example that 2002 could be classified as a "dry" year (per capita flow of 116.9 gpcd) while 2003 could be classified as a "wet" year (per capita flow of 145.1 gpcd). By comparison, 2006 was a "typical" year with per capita flows near the 120 gpcd value.

The peaking factors are then developed by dividing the actual maximum month, week and day flows by the calculated average value. This method is also consistent with how flows and loads are projected into the future. From the data in Table 2, wet weather per capita flow are estimated at 145 gpcd while dry weather per capita flow can be estimated as 115 gpcd. The design value of 120 gpcd is taken as the average base value. From the data in Table 2, the calculated peaking factors in Table 3, and by defining the seasonal per capita flow conditions which may occur, we can define an envelope of flows which could occur for both the year 2030 case as well as the 54 mgd annual average flow case. The resulting flow peaking factors are summarized in Table 4.

TABLE 4
Per Capita Conditions and Flow Peaking Factors

Condition	Per Capita Flow (gpcd)	Max Month PF	Max Week PF	Max Day PF	Peak Hyd. PF
Typical	120	1.30	1.60	2.60	3.5
Wet	145	1.55	1.90	2.90	3.8
Dry	115	1.15	1.30	2.30	3.2

By applying the various flow conditions and peaking factors in Table 4 to the projected year 2030 annual average flow of 44.9 mgd, a seasonal matrix of flow rates can be calculated as summarized in Table 5.

TABLE 5
Year 2030 Projected Flow Rates

Condition	Average (MGD)	Max. Month (MGD)	Max. Week (MGD)	Max. Day (MGD)	Peak Hyd. (MGD)
Typical	44.9	58.3	71.8	117	157
Wet	54.2	69.5	85.3	130	171
Dry	43.0	51.6	58.4	103	144

Similarly, the values in Table 4 can be applied to the annual average design flow of 54 mgd to create a matrix of seasonal flows at the design condition as summarized in Table 6.

TABLE 6
54-mgd Projected Flow Rates

Condition	Average (MGD)	Max. Month (MGD)	Max. Week (MGD)	Max. Day (MGD)	Peak Hyd (MGD)
Typical	54.0	70.2	86.4	140	189
Wet	65.3	83.7	103	157	205
Dry	51.8	62.1	70.2	124	173

The flow rates presented in Tables 5 and 6 then frame the range of projected flow conditions which could occur based on seasonal variability. Even though a specific year might have annual average flows that fall within the typical range (around 120 gpcd), it might still experience a heavy flow event. Such was the case in 2006 for example, a typical flow year, which included one event of heavy sustained rains for about 3 days that resulted in record maximum day flows at the plant. The sewer collection system that feeds the ASA plant is partly a combined sewer system which accounts for the high variability in flows to the plant. This indicates the need to use the wet condition as a projection parameter since a heavy rain event can occur anytime.

These projections are based on the assumption that current peaking factors will translate into future flows. However there are some reasons why this might not be the case:

The first is that high flow storm events add to the base flow as Infiltration and Inflow (I&I) but are not necessarily going to increase proportionally to population. The future increase in storm flow is difficult to predict as it depends on many factors such as aging of the infrastructure (which will increase flows) but also efforts by Fairfax County and the City of Alexandria to reduce I&I by replacing and lining the sewer system.

The second is that the plant is physically limited in the amount of flow it can pass and treat. During high flow events, the plant is currently at capacity even though it is below capacity on an annual average basis. As a design parameter, ASA has to determine what the peak hydraulic flow to the plant will be in the future based on the agreements and obligations it has to treat these peak flows. Currently ASA does not plan on expanding the hydraulic capacity of the plant and is not obligated to do so based on current jurisdictional agreements.

Load Peaking Factors

Historical maximum month, week, and day load peaking factors are summarized in Tables 7, 8 and 9.

TABLE 7
Maximum Month Load Peaking Factors

Year	TSS	CBOD5-T	TKN	NH3	TP	OP
2000	1.08	1.07	1.15	1.32	1.08	1.45
2001	1.26	1.17	—	—	—	—
2002	1.31	1.23	—	—	—	—
2003	1.91	1.55	1.42	1.14	1.94	1.33
2004	1.55	1.77	1.33	1.24	1.49	—
2005	1.22	1.22	1.27	1.08	1.21	—
2006	1.25	1.17	1.13	1.09	1.37	1.30
2007	1.51	1.27	1.18	1.08	1.17	1.21
Average	1.39	1.31	1.25	1.16	1.38	1.32

TABLE 8
Maximum Week Load Peaking Factors

Year	TSS	CBOD5-T	TKN	NH3	TP	OP
2000	1.24	1.21	—	—	1.19	—
2001	1.66	1.22	—	—	—	—
2002	2.08	1.42	—	—	—	—
2003	3.43	2.27	—	—	3.18	—
2004	3.32	2.90	1.75	1.61	2.70	—
2005	1.45	1.41	1.59	1.18	1.27	—
2006	1.96	1.43	1.30	1.18	1.73	—
2007	1.97	1.52	1.23	1.12	1.29	1.22
Average	2.14	1.67	1.47	1.27	1.89	1.22

TABLE 9
Maximum-Day Load Peaking Factors

Year	TSS	CBOD5-T	TKN	NH3	TP	OP
2000	1.77	1.60	1.70	1.62	1.49	1.88
2001	2.43	1.74	1.23	1.56	1.51	2.09
2002	2.83	1.89	1.20	1.16	1.33	1.15
2003	4.35	4.07	7.12	1.89	7.39	2.18
2004	7.09	6.05	3.18	2.12	6.77	1.79
2005	2.41	2.15	1.86	1.84	2.46	1.22
2006	3.30	1.79	1.97	1.52	3.38	2.01
2007	3.77	2.19	1.64	1.34	1.58	1.27
Average	3.49	2.68	2.49	1.63	3.24	1.70

Based on the data from Tables 7-9, the recommended load peaking factors for design are summarized in Table 10. Experience (empirical data reviews at similar facilities) was used to select the recommended peaking factors from the available data set. Since the TSS peaking factors are greater than those for CBOD, the peaking factors for TKN and TP should be greater than those for NH3 and OP since particulate portions may track closer to TSS values while soluble components (NH3 and OP) should track more closely with CBOD.

TABLE 10
Recommended Design Load Peaking Factors

Condition	TSS	CBOD5-T	TKN	NH3	TP	OP
Max. Month	1.40	1.30	1.20	1.10	1.40	1.30
Max. Week	2.00	1.50	1.40	1.20	1.50	1.50
Max. Day	3.50	2.00	2.00	1.60	2.00	2.00

Proposed Design Flows and Loads

The current plant was designed for a peak instantaneous flow of 108 MGD and it is hydraulically limited to pass about 120 MGD including any recycles routed to the head of the plant. Jurisdictional agreements dictate how much flow ASA has to take from the different sewer service areas that feed the plant. When a high flow event occurs, ASA will run their influent pump station to take as much flow as it can and the rest of the flow will surcharge in the collection system. This results in a “capping” of the amount of flow that comes into the plant. As a design parameter, ASA has to determine what the peak hydraulic flow to the plant will be in the future based on the agreements and obligations it has to treat these peak flows. Currently ASA does not plan on expanding the hydraulic capacity of the plant so the recommended design flows are based on the current plant sizing. However, the design flows will assume that even though the instantaneous flow might be capped, the high flow events are likely to be of longer duration and therefore the system will be sized to handle these high flows for periods of up to 1 week.

Table 11 presents recommended design flow rates for both the projected 2030 and 54 mgd design cases and are based on the previous flow developments. Also presented, for comparison, are the design flow values which were previously defined as 2005 design parameters. In selecting projected flow values for Table 11, average flows were taken as presented in the Wet Weather Study for year 2030 and as had been previously defined for the 54 mgd case.

TABLE 11
Summary – Design Flow Rates

Condition	Average (MGD)	Max. Month (MGD)	Max. Week (MGD)	Max. Day (MGD)	Peak Hyd (MGD)
Year 2030	44.9	69.5	85.3	108	108
54 mgd Design	54.0	83.7	108	108	108
2005 Design	54.0	70.0	80	90	108

Recommended design loads for year 2030 and the 54 mgd design cases are presented in Tables 12 and 13, respectively. 2005 design load values are presented in Table 14 for comparison purposes.

TABLE 12
Year 2030 Design Loads

Condition	TSS	CBOD5	TKN	NH3	TP	OP
Annual Average	87,200	67,200	12,500	7,300	2,100	600
Maximum Month	122,000	87,400	15,000	8,030	2,730	780
Maximum Week	174,000	100,000	17,500	8,760	3,150	900
Maximum Day	305,000	134,000	25,000	11,700	4,200	1,200

Units in pounds per day.

TABLE 13
54-mgd Design Loads

Condition	TSS	CBOD5	TKN	NH3	TP	OP
Annual Average	110,000	84,600	15,800	9,130	2,600	752
Maximum Month	154,000	110,000	19,000	10,000	3,640	978
Maximum Week	220,000	127,000	22,100	11,000	3,900	1,130
Maximum Day	385,000	169,000	31,600	14,600	5,200	1,500

Units in pounds per day.

TABLE 14
2005 Design Loads

Condition	TSS	CBOD5	TKN	NH3	TP	OP
Annual Average	100,400	73,400	14,400	--	2,500	--
Maximum Month	140,600	102,800	18,900	--	3,500	--
Maximum Week	170,700	110,100	23,000	--	4,250	--
Maximum Day	--	--	--	--	--	--

Units in pounds per day.

The projected 54 mgd design loads are higher than those defined under the 2005 design. This is consistent with the historical data which showed that loading concentrations are increasing at a greater rate than flow. So this trend translates into increasing loading rates while flows show only modest increases.

Appendix B
Wastewater Characterization Program

Alexandria Sanitation Authority Wastewater Characterization Program TM#4 – Characterization of Wastewater and Residuals at ASA

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DATE: December 5, 2008

TASK: Task Order 1 / Task 2.8 Wastewater Characterization / Subtask 2.8.2 Establish Characteristics of Raw Influent Flow and Recycles

Objectives

The goal of this technical memorandum (TM) is to present wastewater and residuals characterization based on winter sampling data collected by Alexandria Sanitation Authority (ASA) staff over the period of January 10 through January 23, 2008. This data was used to better calibrate process models being used to develop future treatment alternatives. Additionally, this recently collected data was compared to similar data which was collected in 2001 and previously presented in a TM (*ASA Model Wastewater Characterization*; May 13, 2004; CH2M HILL) and to historical data collected in the plant's Operator 10 (OP10) system. A second sampling program was conducted over the summer during the period of July 22 through August 4, 2008 to capture any seasonal variability in the wastewater characteristics.

Wastewater Characterization

A sampling plan was developed which provided direction on sample locations, sample types and parameters to be measured.

The wastewater characterization parameters which are developed from this work include the following values:

1. COD/$CBOD_5$ Ratio
2. Volatile Content of Particulate Organic Matter as a Percent of TSS
3. COD/VSS Ratio
4. Portion of Filtrate COD which is Colloidal as a percent of the Total COD
5. VFA as a percent of the Total COD
6. Acetic, Proprionic and Butyric Acids as a percent of the Total VFA

7. Ratio of Ammonium nitrogen to Total Kjeldahl Nitrogen
8. Nitrogen Content of VSS, mg N/mg VSS
9. Soluble, Nonbiodegradable Organic Nitrogen as a percent of the Total TKN
10. Ratio of Orthophosphorus to Total Phosphorus

This set of characterization parameters are used with standard influent monitoring data (BOD, TSS, %VSS, TKN, Ammonia, TP, pH, Alkalinity) to characterize a wastewater for use in the Pro2D process model.

A previous effort at wastewater characterization was done in 2004 and documented in a TM (*ASA Model Wastewater Characterization*; May 13, 2004; CH2M HILL). This TM sought to validate the parameters being used in a plant model developed at the time. Data analyzed in the TM included a wastewater characterization sampling program carried out in January 2001 and historical data records from 1992 through 2004.

This memorandum uses data collected in January 2008 as the main basis for determining the modeling parameters. Where the data differed greatly from normal parameters, the historical data (if available) was used. Any major discrepancies from the data presented in the 2004 TM are also noted. The data collected in July and August of 2008 is used to note any seasonal variations.

Results for Liquid Flow Streams

Parameter fractionation of the data collected is summarized in Table 1, below.

TABLE 1
ASA Wastewater Characterization Program
Parameter Fractionation Summary

Parameter	Raw WW		PE-A		DWC		GTO		THC	
	W	*S*	*W*	*S*	*W*	*S*	*W*	*S*	*W*	*S*
$COD/CBOD_5$	3.41	2.77	2.15	2.08	8.67	9.02	2.56	2.14	5.09	8.31
VSS/TSS	0.88	0.89	0.84	0.88	0.76	0.75	0.84	0.83	0.77	0.80
COD/VSS	1.83	1.60	2.07	2.15	0.81	1.26	1.80	2.17	1.26	1.16
SCOD Colloidal Fraction, percent Total COD	11.2	13.7	17.5	18.1	----	----	---	---	----	----
VFA Fraction, percent Total COD	4.73	3.75	----	----	----	----	15.9	11.5	---	----
Acetic, Proprionic and Butyric Acids, percent Total VFA	90.0	94.3	----	----	----	----	91.0	93.3	---	----
Ammonium-N, percent Unfiltered TKN	60.8	56.1	72.3	65.2	91.8	80.8	63.2	57.2	6.03	7.23
Nitrogen content of VSS, mg N/mg VSS	0.05	0.05	0.10	0.12	0.92	1.8	0.09	0.11	0.09	0.06
Soluble nonbiodegradable Organic Nitrogen, percent Unfiltered TKN	2.14	1.66	----	----	----	----	----	---	---	---
Ortho-P/Total P	0.35	0.42	0.50	0.63	0.26	0.14	0.23	0.30	0.08	0.20

Abbreviations in Table 1:

W	Winter
S	Summer
Raw WW	raw influent wastewater
PE-A	primary effluent
DWC	dewatering centrate
GTO	gravity thickener overflow
THC	thickening centrate

Discussion

Below is a discussion of the results. A table summarizing the recommended parameters for modeling is included in the Summary section of this TM (Table 3).

Raw Wastewater and Primary Effluent

$COD/CBOD_5$

The winter sampling data indicated average ratios of $COD/CBOD_5$ (mg COD/mg $CBOD_5$) of 3.41 for the raw wastewater and 2.15 for primary effluent. Typical ranges for these values are 2.0 to 2.2 for raw wastewater and 1.90 to 2.0 for primary effluent. That the measured values are higher than expected for municipal wastewater may indicate higher than normal unbiodegradable particulate COD. Review of plant historical data from OP10 indicate a raw wastewater COD/$CBOD_5$ ratio of 2.5 for the period starting August 2003, which corresponds to the startup of Building L and when solids recycles were taken out of the influent sewer, and ending March 2004, when ASA's lab stopped doing routine COD analysis on the raw influent sample. It is recommended that 2.5 be used in future modeling. The summer sampling data indicates a raw wastewater ratio of 2.77 which is closer to the proposed ratio of 2.5 and shows higher biodegradable content in the summer.

VSS/TSS

The average VSS/TSS ratios for the raw influent and primary effluent were 0.88 and 0.84, respectively. These values are typically around 0.75 for raw wastewater and 0.83 for primary effluent. The higher values measured for the raw wastewater may also indicate higher than normal particulate COD coming into the plant. These values and the COD/$CBOD_5$ trend closer to normal following primary treatment which may result from the particulate material being removed in the primary clarifiers. Historical data from August 2003 to March 2004 indicate a raw influent VSS/TSS ratio of 0.82 and a primary effluent ratio of 0.81. The 2004 TM used a raw influent VSS/TSS ratio of 0.81. It is recommended that a raw influent VSS/TSS ratio of 0.82 be used in future modeling. The summer sampling data indicates an average VSS/TSS ratio of 0.89 in the raw influent which matched the data collected in the winter.

COD/VSS

The average COD/VSS ratio in the raw influent and primary effluent was 1.83 and 2.07, respectively. The COD/VSS ratio for influent solids can vary significantly from the ratio commonly suggested for biomass (1.42 mg COD/mg VSS). The 2004 TM reported a raw wastewater ratio of 1.74 based on sampling data from 2001 and recommended to keep the default value of 1.42 in the model as it better correlated to plant data collected from 1992 to 2004. Review of plant historical data between August 2003 and March 2004 indicate a COD/VSS ratio of 1.66 in the raw wastewater and 1.72 in the primary effluent. It is recommended that the value of 1.66 be used in future process modeling. The summer sampling data indicates an average COD/VSS ratio of 1.60.

SCOD – Percentage of COD

Colloidal material does not readily settle and will pass a fiberglass filter commonly used for TSS and VSS measurements. For this reason, colloids are commonly accounted for as part of the soluble component of a sample. By adding a flocculant aid, these particles are enmeshed in the floc and removed. The difference then between the filtrate COD of a non-coagulated sample and the filtrate of a flocculated sample is the colloidal COD. The average value measured for the raw wastewater was 11.2 percent and 17.5 percent for primary effluent. A value of 12.5 percent was reported in the 2004 TM based on historical data during chemical addition (Ferric Chloride added to the primaries between 1992 and 2001) and after chemical addition was discontinued (2002-2003). It is recommended that the value of 12.5% be used in future process modeling. Summer sampling indicated 13.7% in the raw influent and 18.1% in the primary effluent.

VFA Composition

Volatile fatty acids (VFAs) were measured in the raw wastewater and gravity thickener overflow (GTO) in the winter sampling program. Average values were 33.5 mg/L in the raw wastewater and 50.3 mg/L in the GTO. These values corresponded to 4.73 percent of the total unfiltered raw wastewater COD and 15.9 percent of the total unfiltered GTO COD. VFA concentrations were measured for nine different compounds. Three VFA compounds preferred for biological nutrient removal; acetic, butyric and proprionic acids, accounted for 90 percent or better of the total VFA measured. The VFA as a percent of total COD measurement is fairly low which, if it represents an accurate long term average, means biological phosphorus removal could be difficult to achieve without some sort of augmentation.

In the summer sampling, the VFAs concentrations were a little bit lower, with 21.8 mg/L in the raw wastewater and 33.6 mg/L in the GTO. These values corresponded to 3.75 percent of the total unfiltered raw wastewater COD and 11.5 percent of the total unfiltered GTO COD. Acetic, butyric and proprionic acids, accounted for about 94 percent of the total VFA measured.

Ammonium Fraction of Soluble TKN

In the winter, the average ammonium-nitrogen fraction of the total influent TKN was 60.8 percent which is consistent with the normal ratio commonly seen in wastewater. However, the ammonium fraction of the soluble TKN in the raw influent averaged 98 percent using the collected data, which is considered high compared to what was reported in 2004 where a value of 0.80 was recommended based on historical data. A review of the data collected in January 2008 shows that in numerous cases the values for filtered and flocculated TKN (meaning the soluble component of the TKN) are less than the associated measurement of ammonia. This is problematic because by definition, TKN is organic nitrogen plus ammonia nitrogen and therefore the soluble TKN content should always be higher than ammonia content. Because the ammonium to total TKN ratio seems correct, it leads to question the filtered and flocculated TKN values. One reason why we might be seeing a discrepancy is that in the process of filtering and flocculating the TKN by adding zinc and increasing the pH, some ammonia stripping might be taking place.

An ammonium-N value of 60 percent of unfiltered TKN is recommended for modelling.

The summer sampling indicated a ratio of ammonium to TKN of about 56 percent. The ammonium fraction of the soluble TKN was about 90 percent.

Nitrogen Content of VSS

The average nitrogen content of the influent VSS was calculated to be 0.05 mg N/mg VSS which matches the value reported in 2004. It is recommended that a ratio of 0.05 be used in future process modeling. The ratio in the summer was also 0.05.

Non-Biodegradable Organic Nitrogen Fraction

The average soluble nonbiodegradable organic nitrogen (defined as filtered and flocculated TKN minus ammonia-nitrogen) in the UV disinfection system effluent averaged 0.84 mg/L during the winter sampling period. This corresponded to 80% of the final effluent TKN, which averaged 1.05 mg/L during the winter period and 2.14% of the TKN that enters the plant. In the summer, the nonbiodegradable organic nitrogen in the UV effluent averaged 0.62 mg/L which corresponded to 94% of the final effluent TKN and 1.66% of the TKN that entered the plant.

The data set for both the winter and the summer sampling contains several data points where the filtered and flocculated TKN concentration in the UV effluent channel is higher than the final effluent TKN. This could be a result of the TKN concentrations being measured at different locations. In conclusion, the ammonia-nitrogen content in the effluent is very low, so the filtered and flocculated TKN concentration in the UV effluent can be assumed to be about the same as the soluble nonbiodegradable organic nitrogen in the effluent. This nitrogen passes through the plant and is not removed by biological treatment or by chemical addition and therefore it is assumed that the content in the effluent is the same as the content in the influent.

Ortho-P/Total P

In the winter, the average ratio of ortho-P to total-P was calculated to be 0.35 in the raw wastewater and 0.50 in the primary effluent. This value is typically in the range of 0.50 to 0.85 so this represents a relatively low fraction and indicates that a majority of the influent phosphorus is present as organic rather than orthophosphorus. Historical data from August 2003 through December 2007 indicate a long-term average ratio of 0.40. It is recommended that 0.40 be used in future process modeling. Summer sampling confirmed this assumption with an average ortho-P to total-P ratio of 0.42.

Recycles

Dewatering Centrate

Since the dewatering centrate has undergone both aerobic and anaerobic stabilization, the COD/$CBOD_5$ ratio (8.67 in the winter, 9.02 in the summer) is much higher than in the raw influent and primary effluent, as would be expected since the majority of biodegradable material has been removed. For the same reason, the COD/VSS value is lower.

The dewatering centrate sampling data in both winter and summer indicates an average VSS/TSS ratio of 0.76, which is higher than the VSS/TSS ratio in the digested sludge and dewatered cake (about 0.63). This is to be expected because some non-biodegradable materials such as fibers and grit, tend to partition more into the cake phase upon dewatering, leaving the centrate with a higher proportion of the soluble and biodegradable material.

The ammonium percentage of unfiltered TKN is about 92%, which is in line with normal values (90-95%). The nitrogen content of the VSS is very high at 92 percent in the winter and 179 percent in the summer . It would be expected to be similar to values measured in the raw wastewater (around 5 - 10%). Part of the reason for this discrepancy could be loss of ammonia in the preparation of the filtered TKN sample which would lead to lower values and therefore higher results for the calculated particulate TKN (defined as total unfiltered TKN minus the filtered TKN). .

Gravity Thickener Overflow

The values for gravity thickener overflow are consistent with those for raw wastewater. The VFA values are somewhat higher which may be attributable to some amount of fermentation in the thickener itself.

Thickening Centrate

The values for thickening centrate show the effects of biological treatment; the COD/$CBOD_5$ ratio is higher than for either raw wastewater or primary effluent (but lower than dewatering centrate), the VSS/TSS ratio is also lower and similar to the WAS, and the COD/VSS value is lower but not as low as for dewatering centrate. The ammonia percentage of the TKN is very low, as it should be for a nitrifying system, since most ammonia nitrogen has been converted to nitrate.

Results for Residuals Streams

As part of the sampling program, TSS and VSS data was collected from a number of residuals streams. Some of the flowstreams, such as primary scum, had widely varying data while others, like dewatered cake, had very little variation. Overall the VSS/TSS parameters for all solids streams were within normal ranges. Calculated average values for the various residuals streams are summarized in Table 2, below.

TABLE 2
ASA Wastewater Characterization Program
Residuals TSS and VSS Summary

Sample Location	TSS (mg/L)		VSS (mg/L)		VSS/TSS	
	Winter	*Summer*	*Winter*	*Summer*	*Winter*	*Summer*
Primary Sludge (PST)	1,600	1,200	1,100	800	0.677	0.659
Primary Scum	542	294	484	250	0.887	0.866
RAS/WAS	5,000	4,900	3,900	3,600	0.776	0.745
Secondary Scum	7,800	2,600	6,000	1,964	0.781	0.756
Blended Thickened Sludge (BTS)	50,000	52,000	40,300	40,000	0.805	0.766
Digested Sludge (D-CENT FEED)	21,300	25,200	13,400	15,800	0.628	0.626
Tertiary Sludge (TST)	456	530	56	150	0.124	0.268
Dewatered Cake (% TS)	27.5	28.0	----	----	0.630	0.613

Note: Apparent data outliers were not used in calculating average values for TST, BTS and D-CENT FEED values shown in Table 2.

No major seasonal variability was observed in any of the solids process streams from the winter and summer sampling data. The only noticeable trend was a higher VSS content in the tertiary sludge in the summer than in the winter.

Summary and Recommendations

The sampling program provided some valuable information which can be used in the future to provide more accurate process modeling results. Recommendations on parameters to be used in modeling are summarized in Table 3.

TABLE 3
ASA Wastewater Characterization Program
Parameter Fractionation Summary – Recommended Values for Modeling

Parameter	Raw WW
$COD/CBOD_5$	2.5
VSS/TSS	0.82
COD/VSS	1.66
SCOD Colloidal Fraction, percent Total COD	12.5
VFA Fraction, percent Total COD	4.73
Acetic, Proprionic and Butyric Acids, percent Total VFA	90.0
Ammonium-N, percent Unfiltered TKN	60
Nitrogen content of VSS, mg N/mg VSS	0.05
Soluble nonbiodegradable Organic Nitrogen, percent Raw Unfiltered TKN	2.14
Ortho-P/Total P	0.40

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit			**Use as LC_{50} in Special Condition, as TUa on DMR**				
ACUTE	**100% =**	**NOAEC**	**LC_{50} =**	**NA**	**% Use as**	**NA**	**TUa**
ACUTE WLAa		**0.3**	Note: Inform the permittee that if the mean of the data exceeds				
			this TUa:	**1.0**	a limit may result using WLA.EXE		

Chronic Endpoint/Permit Limit			**Use as NOEC in Special Condition, as TUc on DMR**				
CHRONIC	**1.462574684**	**TU_c**	**NOEC =**	**69**	**% Use as**	**1.44**	**TU_c**
BOTH*	**3.000000074**	**TU_c**	**NOEC =**	**34**	**% Use as**	**2.94**	**TU_c**
AML	**1.462574684**	**TU_c**	**NOEC =**	**69**	**% Use as**	**1.44**	**TU_c**
ACUTE WLAa,c		**3**	Note: Inform the permittee that if the mean				
CHRONIC WLAc		**1**	of the data exceeds this TUc:		**1.0**		
* Both means acute expressed as chronic			a limit may result using WLA.EXE				

Enter data in the cells with blue type:

Entry Date:	11/03/08					
Facility Name:	Alexandria SA					
VPDES Number:	**VA0025160**					
Outfall Number:	**1**					
			<u>**% Flow to be used from MIX.EXE**</u>		<u>**Difuser /modeling study?**</u>	
Plant Flow:	**54**	MGD			Enter Y/N	**n**
Acute 1Q10:	**0**	MGD	**100**	%	Acute	1 :1
Chronic 7Q10:	**0**	MGD	**100**	%	Chronic	1 :1

Are data available to calculate CV? (Y/N)	**N**	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	**N**	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWC_a	100	%	Plant flow/plant flow + 1Q10
IWC_c	100	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute		1	100/IWCa
Dilution, chronic		1	100/IWCc
WLA_a		0.3	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c		1	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$		3	ACR X's WLA_a - converts acute WLA to chronic units
ACR -acute/chronic ratio		10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation		0.6	Default of 0.6 - if data are available, use tables Page 2)
Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp) No. of samples 1

**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

$LTA_{a,c}$	1.2328341	WLAa,c X's eA						
LTA_c	0.6010373	WLAc X's eB				Rounded NOEC's		%
MDL** with $LTA_{a,c}$	3.000000074	TU_c	NOEC =	33.333333	(Protects from acute/chronic toxicity)	NOEC =	34	%
MDL** with LTA_c	1.462574684	TU_c	NOEC =	68.372577	(Protects from chronic toxicity)	NOEC =	69	%
AML with lowest LTA	1.462574684	TU_c	NOEC =	68.372577	Lowest LTA X's eD	NOEC =	69	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

						Rounded LC50's		%
MDL with $LTA_{a,c}$	0.300000007	TU_a	LC50 =	333.333325	% Use NOAEC=100%	LC50 =	NA	%
MDL with LTA_c	0.146257468	TU_a	LC50 =	683.725769	% Use NOAEC=100%	LC50 =	NA	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data ***********	LN of data		Invertebrate IC_{25} Data or LC_{50} Data ************	LN of data
1	0		1	0	
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Coefficient of Variation for effluent tests

CV =	0.6	(Default 0.6)
ð^2 =	0.3074847	
ð =	0.554513029	

Using the log variance to develop eA
(P. 100, step 2a of TSD)
Z = 1.881 (97% probability stat from table

A =	-0.88929666
eA =	0.410944686

Using the log variance to develop eB
(P. 100, step 2b of TSD)

ð$_4^2$ =	0.086177696
ð$_4$ =	0.293560379
B =	-0.50909823
eB =	0.601037335

Using the log variance to develop eC
(P. 100, step 4a of TSD)

ð^2 =	0.3074847
ð =	0.554513029
C =	0.889296658
eC =	2.433417525

Using the log variance to develop eD
(P. 100, step 4b of TSD)

n =	**1**	This number will most likely stay as "1", for 1 sample/month.
ð$_n^2$ =	0.3074847	
ð$_n$ =	0.554513029	
D =	0.889296658	
eD =	2.433417525	

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Convert LC_{50}'s and NOEC's to Chronic TU's

for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here:

enter it here:	NO DATA	$\%LC_{50}$
	NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	100	1.0		
Dilution series to use for limit			69	1.4492754
Dilution factor to recommend:	0.5		0.8306624	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	50.0	2.00	83.1	1.20
	25.0	4.00	69.0	1.45
	12.5	8.00	57.3	1.74
	6.25	16.00	47.6	2.10
Extra dilutions if needed	3.12	32.05	39.5	2.53
	1.56	64.10	32.9	3.04

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Alexandria, Virginia.

PUBLIC COMMENT PERIOD: April 28, 2009 to 5:00 p.m. on May 28, 2009

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: City of Alexandria, Virginia Sanitation Authority
1500 Eisenhower Avenue
PO Box 1987, Alexandria, VA 22313-1987
VA0025160

NAME AND ADDRESS OF FACILITY: Alexandria Advanced Wastewater Treatment Plant
1500 Eisenhower Avenue, Alexandria, VA 22314

PROJECT DESCRIPTION: The City of Alexandria, Virginia Sanitation Authority has applied for a reissuance of a permit for the public Alexandria Advanced WWTP. The applicant proposes to release treated sewage wastewaters from residential areas at a rate of 54.0 Million Gallons per Day into a water body. The Class A Sludge from the treatment process will be applied to the land. The facility proposes to release the treated sewage in the Hunting Creek in Alexandria, Virginia in the Potomac River watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, cBOD, TSS, DO, TKN, Ammonia, *E. coli*, Chlorine, Nitrate+Nitrite, Total Nitrogen and Total Phosphorus.

This facility is subject to the requirements of 9 VAC 25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. DEQ may hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ-Northern Regional Office by appointment.
Name: Douglas Frasier
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3873 E-mail: ddfrasier@deq.virginia.gov Fax: (703) 583-3821

Revised 2/2003

<u>State "Transmittal Checklist" to Assist in Targeting</u>
<u>Municipal and Industrial Individual NPDES Draft Permits for Review</u>

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name:	Alexandria Advanced Wastewater Treatment Plant
NPDES Permit Number:	VA0025160
Permit Writer Name:	Douglas Frasier
Date:	3 November 2008

Major [X] **Minor** [ ] **Industrial** [ ] **Municipal** [X]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application?	X		
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?	X		
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?	X		
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?			X
8. Whole Effluent Toxicity Test summary and analysis?	X		
9. Permit Rating Sheet for new or modified industrial facilities?			X

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?		X	
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?	X		
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?			X
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?	X		
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?		X	
10. Does the permit authorize discharges of storm water?		X	

I.B. Permit/Facility Characteristics – cont.	**Yes**	**No**	**N/A**
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production?		X	
12. Are there any production-based, technology-based effluent limits in the permit?	X		
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?		X	
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?		X	
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?	X		
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?	X		
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs
(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	**Yes**	**No**	**N/A**
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits – General Elements	**Yes**	**No**	**N/A**
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?			X

II.C. Technology-Based Effluent Limits (POTWs)	**Yes**	**No**	**N/A**
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?	X		
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?	X		
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?			X
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?	X		
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?	X		
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?		X	
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			X

II.D. Water Quality-Based Effluent Limits	**Yes**	**No**	**N/A**
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?			X
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?			X
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		

II.D. Water Quality-Based Effluent Limits – cont.	Yes	No	N/A
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?	X		
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?		X	
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?		X	
4. Does the permit require testing for Whole Effluent Toxicity?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?	X		
2. Does the permit include appropriate storm water program requirements?			X

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			X
4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?			X
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?	X		
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?		X	
a. Does the permit require implementation of the "Nine Minimum Controls"?			X
b. Does the permit require development and implementation of a "Long Term Control Plan"?			X
c. Does the permit require monitoring and reporting for CSO events?			X
7. Does the permit include appropriate Pretreatment Program requirements?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		
List of Standard Conditions – 40 CFR 122.41 Duty to comply; Duty to reapply; Need to halt or reduce activity not a defense; Duty to mitigate; Proper O & M; Permit actions Property rights; Duty to provide information; Inspections and entry; Monitoring and records; Signatory requirement; Bypass; Upset Reporting Requirements: Planned change; Anticipated noncompliance; Transfers; Monitoring reports; Compliance schedules; 24-Hour reporting; Other non-compliance			
2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name Douglas Frasier

Title Environmental Specialist II

Signature

Date 3 November 2008